QUEENSLAND AGRICULTURAL JOURNAL

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Agriculture.

SEED WHEAT FOR FARMERS.

The Government's scheme for providing farmers with seed wheat was well advanced during the past month. It had been estimated by the Department of Agriculture and Stock that the requirements would be about 60,000 bushels, but up to the last date on which applications for seed could be accepted (15th March), 70,000 bushels had been applied for. The Minister for Agriculture (Hon. W. Lennon) who in the middle of March paid a visit to the grading establishment at Toowoomba, stated on his return that he is highly gratified at the quality of wheat that is being graded for seed purposes. The methods that are being adopted he thinks are as nearly perfect as can be made, and provide an interesting exhibition of the work of machinery when controlled by brains. Mr. Lennon expects that the applications will necessitate about 70,000 bushels of seed wheat being distributed. Large quantities already have been

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distributed. Unfortunately, owing to the very dry season in 1915, the wheat generally was poor and pinched, consequently there is a large proportion of "seconds," or chick wheat, which is being sold at reduced prices, and for which there is a satisfactory sale. Mr. Lennon, referring to the prices to be charged for seed wheat, said it was proposed to add together the purchasing price of the wheat and the total expenditure incurred in storing, handling, cleaning, and delivering of it, and then to strike a flat rate which would just cover the outlay and expenses. It was not proposed, he said, to make any profit at all on the transaction, but to charge just sufficient to meet the total cost to the department. Referring generally to the seed wheat distribution scheme, he said he thought the department was doing a really good work for the State, and personally he thought it was just as important to see that the farmer was supplied with properly-graded wheat as it was to seek to improve the breeds of stock for the stock breeder. Several varieties of approved rust-resisting wheats are being handled, and Mr. Lennon considers that the seed that is being distributed is of the very finest quality.

CHICORY IN SOUTH AUSTRALIA.

The "Journal of Agriculture of South Australia" stated in November last year that "The chicory industry has languished in the Rendelsham (Millicent) district (S.A.) because the growers have allotted to outside speculators the performance of a very necessary part of the work which might have been easily done by themselves. A movement has now been launched with a view of erecting kilns and buildings to convert the raw chicory into the finished product before it leaves the growers' hands, and to enable the producers to deal direct with the coffee blenders."

Last month, by the courtesy of the editor of the above Journal, we received the following information on the chicory industry in South Australia. We have had several inquiries since this product was discussed in the "Q.A. Journal," as to the possibility of obtaining seed. Mr. Finnie, editor of the "S.A. Journal of Agriculture," states that a prominent seed merchant in Adelaide is prepared to supply a few pounds of seed at about 3s. 6d. per lb., but the supply is at present very short. The variety is *Cichorium Intybus,* imported from Europe.

Following notes refer to chicory-growing in the South-east of South Australia:—

Chicory is grown in the South-east only in the peat lands at Rendelsham. The area planted is limited, and depends upon the orders received from Adelaide merchants, it being the custom to place orders a season ahead.

From what I gathered in conversation with growers when in Rendelsham last Thursday (February, 1916), the ground to be planted is ploughed about the middle of August, to kill off the weeds, &c., and the seed is sown early in September, 2½ lb. of seed being used to the acre. It is sown with the ordinary onion drill in drills 7 in. apart.

The after cultivation consists only of hand weeding, as it does not do to disturb the peat on account of its liability to drift and blow away. In fact this is one of the greatest troubles growers have to contend with. One grower informed me that he had sown twice this season, and had not a plant left. It is not spaced or thinned at all. It is generally sown in a direction in which the wind will cause the least injury, the natural lay of the land being taken into consideration.

A strip of rye is generally sown every chain or so to act as a wind-break.

Digging commences on the 1st June, three drills being placed in a row, then carted to a trough, where the tops are cut off, and the chicory washed with a rough stable broom and then bagged.

Manure (superphosphate) at the rate of 1 bag (200 lb.) to the acre is used.

About 30 to 40 acres are grown in Rendelsham every year, and the yield is about 8 to 14 tons to the acre. Portion is sent to Beachport for kiln drying, and portion is sent direct to Adelaide.

The cost of production is about as follows:—

Ground rent	£2 an acre
Seed, and putting in	15s. an acre
Harvesting	25s. to 27s. 6d. per ton

Market value, £3 7s. 6d.,* bags found, on trucks Rendelsham.

There are some hundreds of acres in the district that would grow chicory well, but the market is at present limited. I understand a movement is on foot to establish a kiln at Rendelsham with a view of finding outside markets and encouraging growers to go in more largely for this crop. It can be grown on the same land two or more years in succession, the chief difficulty being the weeds and wind, and improves the land for cereal growing, though rye and barley are the only grain crops that grow well in the peat land.

I think there is no special variety of chicory grown, though I overlooked that point when inquiring.

AGRICULTURE TAKES PRECEDENCE.

Mr. Temple Clark sends us the following extract from a farm journal:—

A favourite subject for debate in debating societies is the respective merits of agriculture, mining industry, and commerce as factors of national prosperity. There can be little doubt that in a well-organised community agriculture must rapidly take precedence and form the base and the mainstay of national prosperity. It is at least so in the United States of America, where the cereal crops are of a truly stupendous

* The price quoted is presumably for the roots as harvested, not dried, as there appears to be no drying kiln at present at Rendelsham. Averaging the yield at 11 tons, the gross value per acre would be £37 2s. 6d. Deducting expenses (less ground rents), £14 10s., the net return is approximately £22 12s. 6d.

immensity. In the season just completed, the farmers of America have obtained £1,116,000,000 worth of produce from the soil, and agriculture is the chief wealth of the country, all the vast manufacturing resources notwithstanding. The New York "Journal of Commerce" compares the crops with those for last year as under:—

	1914. Bushels.	1915. Bushels.
Wheat	891,017,000	1,002,029,000
Corn	2,672,804,000	3,026,159,000
Oats	1,141,060,000	1,517,478,000
Barley	194,953,000	236,682,000
Rye	42,779,000	44,179,000
Buckwheat ..	16,881,000	16,738,000
Total ..	4,959,494,000	5,843,265,000

As showing what immense scope there is for the development of our own agriculture it may be stated that, although the area of the two countries is about equal, the production of cereals in Australia has never exceeded 135,000,000 bushels, against the 5,843,000,000 of the United States.

COTTON.

The first statistical information of cotton in Queensland is for the year 1860, when 14 acres were under crop. A civil war in America gave great impetus to the cultivation of it under the plantation system, and the Government of the day fostered it by a bonus on exported cotton varying from £10 to £2 10s. for each bale of ginned cotton of 400 lb. in weight.

In 1870 there were 14,674 acres under crop, and in 1871 6,505 bales were exported. The highest price obtained for raw cotton was in 1864, when 2s. 2¼d. per lb. was secured in Liverpool, and the total bonus paid in that year was £84,868. Owing to the cessation of the bonus and the resumption of the export trade by America, cultivation declined annually from 1870, until in 1887, when there was no area under crop.

The second period of cotton-growing was between 1890 and 1897, when the Ipswich Cotton Company was established and encouraged by a bonus for the first 5,000 yards of cotton goods manufactured. The company secured the bonus but afterwards went into liquidation.

The third period commenced with the drought of 1902, when this department advocated cotton as a subsidiary crop on the farm to serve the double purpose of producing a marketable article, and, as it is a drought-resisting plant, to serve as fodder for cattle at that time. The crop was taken by the department and sold on owners' account, the growers receiving 5·9d. per lb. for the raw cotton, which was sold in Australia.

Following this revival, the firm of Joyce Brothers purchased the Ipswich Cotton Mills and continued to work them until 1912, when they

were compelled to close down owing to the competition of the imported article. But few lines of cotton goods were made at Ipswich, and the several applications to the Commonwealth Government by the firm for assistance in one form or another to compete with the imported goods received no encouragement.

The position of the industry was therefore, in 1913, again in a critical state, and to save it, and possibly to encourage the expansion of it, the Government again entered the field and offered to take all raw cotton and to make an advance thereon of 1½d. per lb. The raw cotton was received and ginned at this department and sold, the return to the growers being equal to about 1¾d. per lb. The process was repeated during 1914-15, the crop from which, owing to the war, has not yet been sold, and for the crop that is now maturing the grants to farmers have been raised to 1¾d. It is proposed, as soon as circumstances allow, to send ginned cotton, which amounts to the ginning of two years, to Europe to really test what the market value of the average cotton grown here is worth.

Cotton as a subsidiary crop on the farm should be a valuable by-product to the farmer because, in addition to producing a marketable article, it is a plant that withstands dry weather and is good feed for cattle.

It is quite understood that the large plantation days have passed, but there is no reason why each farmer should not cultivate an acre or a few acres of this profitable crop.

Apart from what has been said of the acts of the department, much information has been supplied to those who contemplate or made inquiry concerning the matter, and persons have been engaged to go amongst the growers to advocate its cultivation; but the knowledge of the preceding failures makes it probable that the resuscitation of it will be attained by degrees.

It may be stated that the requests for a supply of cotton seed by farmers all over the State during the past twelve months have been numerous. The department has, however, made arrangements for the importation of a quantity of seed of the best three varieties of cotton grown in the United States, and this is expected to arrive in Brisbane not later than September next, or even earlier, which will be in plenty of time for sowing for a 1916-1917 crop. The seed will be distributed to *bonâ fide* applicants. The quantity imported will be sufficient to put 1,000 acres at least under cotton, and putting the minimum yield of that area at 1,000 lb. of seed cotton, the immediate cash return to the grower, at the price fixed by the department of 1¾d. per lb., will amount to about £7 5s. Deducting ½d. per lb. for picking (£2 1s. 8d.) the immediate net return would be about £5 3s. 4d. per acre, and to this would be added all profits made over and above the cost of ginning, baling, freight, &c. Considering that the minimum yield may be 1,000 lb. of seed cotton per acre, the return would amount to 1,000,000 lb., worth, at 1¾d. per lb., roughly £7,290, all of which will go into the farmers' pockets, plus any profit on sales made by the department.

Pastoral.

FARMERS' SHEEP IN THE BURNETT DISTRICT.

BY "BRINY."

As is well-known, a great number of sheep were at one time run over the Burnett district.

The country was found to be unsuitable to the conditions under which sheep were then run, and cattle took their place on the stations into which the district was in those days divided. It is difficult to obtain much authentic information about the sheep of those early times, and to anyone in search of such the statements given are generally of a very vague and of a hearsay character. It is certain, however, that sheep did not do well, and speargrass and foot rot are the most general reasons given for their failure.

The object of this article is to give a concise account of the efforts made by selectors during the last twelve years to establish sheep on small forest areas under the latter-day much altered conditions in the Burnett district. (Forest is here particularly mentioned as distinct from the scrub areas.)

The results of all of these several selectors' attempts were more or less failures, and in some cases disastrous; nevertheless, from among the ruins of their efforts much valuable material may be obtained on which to base opinions for guidance in the future.

At the outset the writer would like to point out that, although it is fully given as a reason to-day, worm trouble was never mentioned ten years ago as a cause of sheep leaving the Burnett in the early days, and in the writer's opinion worms cannot then have been such an all-pervading factor in the exodus of the sheep as has been the case in this more recent effort, some particulars of which are given later in this article.

The town of Gayndah was established during the sheep days, and the wool teams for many years formed the greatest part of the traffic on the Gayndah to Maryborough road. The ruins of woolsheds may still be seen on the stations, and these, together with the raised square mounds (a one-time night yard) and ruins of a hut with which, in conjunction, the district is studded, all go to show that sheep were for some years well established in the Burnett.

The writer, about ten years ago, on several occasions conversed with old shepherds of those early days, and they could not recall any experiences with either worms or fluke, nor have other "old timers" conversed with—station hands of the early days—been able to call to mind worm troubles among the sheep. Certainly, the sheep were never drenched. Worms probably were present, and were possibly at

times an unrecognised cause of mild trouble; but it is certain—and later experience confirms this—that under conditions of shepherding over large areas in which sheep were then kept they were not affected with worms to anything like the disastrous extent that they were infected when kept under the conditions of being paddocked in small areas, heavily stocked, as they were kept during this latter period I now write of.

It seems certain that sheep left the Burnett because it was found impossible to shepherd them profitably in country ever increasing in speargrass; and this, in conjunction with the fact that at about that time the Western country was opened up for sheep, caused the sheep to quickly leave the Burnett for more profitable conditions. It is the writer's wish to show that the later settlers in trying, through subdivision and stocking, to make conditions for speargrass seed impossible, really created a condition most favourable for worm troubles which sheep in the early days, through not being restricted to small areas, did not experience, and also to show that both speargrass and worm troubles may, with proper precautions, at the same time be avoided.

It must first be shown that there is a very limited quantity of sheep feed in the forest pastures of the Burnett, and that sheep when allowed to pick and choose over a large area, or when confined in paddocks very lightly stocked with sheep, will keep free from worms and do well, and that if their forest feed is supplemented with a little other, such as lucerne, they will do very well indeed.

During the great drought of 1902 many sheep were travelled to the Burnett for relief country, amongst other parts to the Degilbo district. The drovers found that the sheep did well, worms were not complained of, and of speargrass and foot rot there was none.

Noticing this, a selector at Didcot, an experienced sheep man, stocked his selection with sheep. These appeared to do well for two or three years; speargrass was a little trouble, but sheep were during that time never drenched for worms, nor were there losses due to worms. This selector reared lambs successfully, and increased his flock by this means and by purchases. The object throughout was to heavily stock and to keep the grass well hammered, to effect the dual purpose of ridding the place of speargrass and to also provide that short bite for the sheep such as, in conjunction with other favourable conditions, they thrive on.

When this selector, through increase of his flock and subdivision, was able to attain, in these respects, his object, his sheep became worm-infested, and to such an extent that they must have been highly unprofitable.

On the strength of this first selector's early success a dairy farmer, who had some small experience with sheep, purchased 100 crossbred weaners of mixed sexes and heavily stocked a small paddock. In a very short time these sheep were highly infested with worms, and in spite of continual drenching the losses were heavy. A few years later

this same farmer purchased more sheep (Merino wethers), and by running them on the forest and supplementing their feed with a little lucerne and, I believe, paspalum, he found them very profitable.

Another case may be mentioned in which 1,000 Comeback ewes were introduced. These were just 8-tooth. They were shepherded for seven months over country which had been previously burnt. During this time, although carefully watched, they showed no signs of worms, and they were never drenched.

They were then confined in a 320-acre paddock, the intention being to eat it out, and after burning change them to another. They, however, soon showed symptoms of worms, and had thereafter to be continually drenched.

After being six months in paddocks, 350 of the poorest of these sheep were travelled to the Darling Downs. So poor and worm-ridden were they that the owner was much criticised for even starting them. They, however, improved from the outset, and this in spite of the fact that the greater part of the route lies through sheep-condemned country. So greatly had they improved that they were sold on arrival at 3s. in advance of their original cost in the same state of wool.

Two sheep from this flock escaped into some thousands of acres of open country—Crown land—used as relief country by dairy farmers of the district. It was therefore heavily stocked with cattle, and consequently free from speargrass. These sheep were found and run down months later and were rolling fat. Clearly they had suffered from neither speargrass nor worms.

One other instance I will give of some purebred Leicester ewes and Merino ewes introduced near Gayndah. These were run in small paddocks heavily stocked and did no better than the rest.

It has been shown, then, in the cases quoted that sheep travelled over roads of the Burnett district during drought time after these roads have been previously heavily fed off by cattle have invariably done well, because they have moved over fresh country daily, and the sheep have been able to pick and choose.

And sheep travelled over roads in good seasons and shepherded in good seasons have also done well in the Burnett for the same reason.

Sheep confined in small areas and heavily stocked no doubt, also, at first pick and choose and do all right, but their choice is limited, and they soon are compelled to eat that bulky coarse growth on which they cannot thrive. They fall away in condition, and their weakened constitutions are unable to resist the ravages of worms, for whom, we are told, it is natural in limited numbers that they should be the hosts.

Sheep brought into the Burnett and shepherded over a restricted area, although on burnt feed about 3 inches high, will never camp. They travel from daylight until dark looking for that which they are unable to find in sufficient quantity; and that they then start to chew

the cud is induced more by the restraints of the night yard than to that well-filled, contented condition such as they would have attained in a few hours on equally well-grassed sheep country.

It may be argued that sheep shepherded over a large area do not infect it so heavily with worms as they would do if the same number were confined in a much smaller area, and also that sheep travelled over fresh country roads are unable to pick up the parasites with which they may have infested the country behind them. And no doubt this would be true; but we find cattle subject to the same stomach worm, and when, through overstocking and in time of drought, we see an emaciated steer with a swelling under its jaw, it is not because this beast or its mates have more heavily infested the paddock with worms, but rather because the beast has been unable to attain from the scant and unsuitable food available sufficient to nourish and keep up its constitution during its growing period, and it thus, like the sheep and for the same reasons, becomes infested with worms. The difference is that cattle normally thrive on the long rank grasses of the coastal areas; sheep will thrive only on the most succulent shoots of these grasses and on the couch grass and small quantity of herbage which grows amongst them. The sheep in the first example quoted at the beginning of this article evidently did well enough until, through breeding and purchases and subdivision, the country became too heavily stocked to enable the sheep to sufficiently discriminate in their feed. In the third instance given, although sheep were first a failure, when Merino wethers were run on the same country and their feed was supplemented with a little lucerne and paspalum, worm trouble did not appear and the sheep were sold as fats.

A well-nourished calf, reared on its mother, does not suffer with worms, yet how many poorly nourished poddie calves die of worms yearly. And the sheep may well be compared along with the poddie calf in this respect—that if they are well nourished there will be no need to drench them for worms. So good results did the writer obtain from giving a few sheep half-a-pint of corn each daily that he extended the experiment and stocked a 60-acre paddock heavily with wormy sheep, and daily a certain six of these sheep were fed with a very much smaller quantity of corn, and the beneficial results were very noticeable.

It seems, then, that the solution of the difficulty is to stock the paddock with grown cattle who will eat off and thrive on the large bulk of the grass. (The couch grass and herbage is not materially diminished if judiciously fed off with grown cattle.) When the cattle have eaten as close as is profitable for them there is still ample feed for a sheep to 3 or 4 acres. The cattle will have overcome the speargrass difficulty and a sheep will find remaining on the 3 or 4 acres all the feed it may require. This, then, leads us a step further, for in the well-conditioned sheep the fleece is full of yolk, and this soapy substance congeals on any speargrass there may be in the wool and so destroys its nature that if there is any length in the wool the seed loses its

power to penetrate further. Therefore, condition is not only a preventive against worms, but is also a great help against a reasonable quantity of speargrass.

Much has been claimed for salt as a preventive for worms in sheep, and for a salt and turpentine lick. The writer has found that, although access to salt is good for sheep, 900 sheep will clean up as much as 4 gallons of coarse salt in a night without any beneficial results, as regards worms, over a period. If turpentine is added, the sheep will eat less, but there is no improvement in the result.

A good deal has been said of the unsuitableness of the Merino breed as introduced in the early days. In the Burnett, amongst the instances given there have been kept Lincolns, Leicesters, Crossbreds, Romney Marsh and pure Merino, and the longwools and crossbred made, I believe, the poorest showing of the lot. The Romneys introduced were rising 2-tooth, and as such, in view of what has been done with this breed in other parts, cannot be considered a fair trial. The writer does not here wish to argue that the longwools are not more suited to a wet district, but rather that the district mentioned is not a wet one in a sense as should be applied to these breeds. There are heavy wet spells, but the prevailing conditions are dry, and the number of wet days in the year comparatively few.

The crossbred cannot live alongside the Merino in hard, dry country, and being difficult to get and more expensive, the farmer may consider it better to select large-framed Merino ewes, and if a Romney or longwooled ram is used, there will be a profitable fleece in the flock and crossbred lambs for the market.

It will be noticed that throughout this article sheep on forest areas only have been dealt with. Sheep at the present time are being successfully run on the artificial grasses on the scrub lands of the old Degilbo run, and their full-blooded eyes and lean jaws show they will do as well on this artificial pasture in the Burnett as they will on artificial grasses or crops of the forest, and these remarks cannot apply to them. The problem to solve has been how to succeed with sheep on the forest grasses.

In conclusion, I would like to point out this article is not written as a scientific treatise on worms in sheep, but it is rather the observations of a bushman experienced with sheep, and who has had sheep in the Burnett and has watched them pretty closely while he had them.

[Mr. W. G. Brown, sheep and wool instructor, Department of Agriculture and Stock, to whom the above article was submitted, writes:—"The above article on 'Sheep in the Burnett' is very interesting. For one reason, it is so difficult to get any authentic information as to the experiences of the sheep-farmers of, say, forty years ago; and, for another, the opinions expressed in it tally in great measure with such information as I have been able to collect. As to the questions raised, I propose to comment on one or two of them in future issues of the Journal, not in a spirit of controversy, but to supplement 'Briny's' clear and interesting article."]

Dairying.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

Milking Records of Cows for Month of February, 1916.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
Lady Melba	Holstein	17 Dec., 1915	1,070	3·8	47·68	
Madam Melba	,, ...	28 Oct. ,,	782	4·0	36·72	
Burton's Lady	Shorthorn ...	13 Jan., 1916	721	4·0	33·86	
Miss Melba	Holstein	30 Sept., 1915	700	3·9	32·04	
Miss Bell ...	Jersey	8 Sept. ,,	491	5·5	31·93	
Burton's Lily	Shorthorn... ...	13 Jan., 1916	673	4·0	31·60	
Violette's Peer's Girl	Jersey	8 Dec., 1915	542	4·9	31·32	
Sweet Meadows	,, ...	28 Sept. ,,	429	6·0	30·69	
Lady Margaret	Ayrshire	14 Oct. ,,	563	4·6	30·51	
Miss Edition	Jersey	27 Sept. ,,	479	4·9	27·66	
Lady's Maid	Shorthorn... ...	26 Jan., 1916	580	4·0	27·24	
Mistress Bee	Jersey	21 Jan. ,,	497	4·6	26·84	
Lady Twylish	,, ...	5 June, 1915	402	5·4	25·66	
Twylish's Maid	,, ...	22 Oct. ,,	440	5·0	24·96	
Noble Dot ...	,, ...	2 May ,,	387	5·4	24·69	
Gretchen ...	Holstein	16 Aug. ,,	551	3·8	24·54	
Constancy ...	Ayrshire	24 Nov. ,,	469	4·4	24·28	
La Hurette Hope	Jersey	17 Nov. ,,	427	4·8	24·16	
Bella ...	Ayrshire	25 Dec. ,,	506	4·0	23·77	
Special Edition	Jersey	1 Nov. ,,	427	4·7	23·60	
Iron Plate ...	,, ...	20 Jan., 1916	432	4·5	22·89	
Rosine ...	Ayrshire	7 Aug., 1915	509	3·8	22·68	
Netherton Belle	,, ...	23 April ,,	396	4·7	21·83	
Dottie	Shorthorn... ...	27 Nov. ,,	399	4·6	21·67	
Daisy ...	Holstein	23 Nov. ,,	495	3·7	21·54	
Simple Interest 9 h	Jersey	22 Oct. ,,	372	4·9	21·49	
Silver Nell...	Shorthorn	16 Aug. ,,	413	4·5	21·09	
Lucinda ...	Ayrshire	14 Oct. ,,	470	3·9	20·93	
Rosebud II.	,, ...	11 Oct. ,,	458	3·8	20·39	
Bluebell ...	Jersey	20 June ,,	360	4·8	20·37	
Dolly ...	Shorthorn... ...	23 Jan. ,,	359	4·8	20·29	
Miss Jean ...	Ayrshire	5 Nov. ,,	430	4·0	20·19	
Mischief ...	,, ...	27 Sept. ,,	465	3·7	20·14	
Jeannie ...	,, ...	7 Aug. ,,	439	3·9	20·09	
Lady Spec.	,, ...	6 Jan., 1916	438	3·9	20·00	

In addition to such natural pasture as was available, the cows received a daily ration of oaten chaff, lucerne chaff, and bran.

TO MAKE CHEESE IN A SMALL WAY.

Some time ago, a pamphlet (now out of print) was issued by the Department of Agriculture under the title of "Papers for the People by Practical Men." Amongst these papers was one by Mr. Baron Jones, then manager of No. 1 Travelling Dairy, entitled "Cheese-making Simplified," and the directions therein given were as follows:—

"It has often been remarked by visitors to the travelling dairy that the cheese-making plant is on too extensive a scale for a small farmer to entertain. In order to show the simplicity with which cheese can be made, the pupils of the travelling dairy are instructed in a simple method of making cheese at their own homes by using two ordinary washing tubs in place of a large cheese vat which forms part of the dairy plant. The operation is performed in the following manner:— For a cheese of 10 lb. take about 3 gallons of night's milk, which must be put in small dishes until morning and kept *thoroughly sweet;* then having two tubs ready, one being sufficiently large to contain the other, leaving a space for water between them, place a strainer cloth over the inner tub, then pour in the 3 gallons of night's milk without removing the cream, to which add 7 gallons of morning's milk fresh from the cow. In the outer tub add sufficient water to raise the whole mass to a temperature of 84 degrees Fahr. At this stage about 4 drachms of Barnekow's Annatto or colouring matter should be added and thoroughly stirred in, after which 8 drachms of Barnekow's rennet, mixed with about a pint of cold water, should be also added, stirring thoroughly so as to mix evenly through the milk. The stirring should not be continued more than 1 minute; the milk being allowed to come to a perfect rest, and remain stationary for 40 minutes, when the curd will be of a sufficiently firm consistency to cut, which can be accomplished in the following manner:—Tie together firmly by the handles two or three ordinary carving knives; draw these so as to cut the curd into squares. After which gently turn these squares of curd so as to present the flat surface to the top; the knives may then be again drawn through, cutting the curd into small cubes or dies of about ½-inch. After allowing the curd to rest for a few minutes, warm water should be let in between the two tubs in sufficient quantities to raise the temperature of the curds and whey to 100 degrees Fahr., taking about 1 hour in doing so; the whole mass being gently stirred during this time to prevent any of the curd from packing together or adhering to the side or bottom of the tub, and to distribute the heat as evenly as possible throughout the entire bulk. The next stage is the most important in the whole process, as upon its being properly carried out depends the whole character of the cheese. Great care in acquiring the taste necessary for ascertaining the proper time for removing the

curds and whey is required, as, should the whey be allowed to become in the least sour, the cheese will be spoiled; and, on the other hand, if it is removed while sweet the cheese will not keep sufficiently long to mature. As an indication that the whey has been withdrawn too late from the curd, the cheese after being removed from the press will in a few hours become quite moist and inclined to run a watery substance, not drying or forming a rind as of a properly made cheese. It is necessary to keep the curds and whey at or near this temperature of 100 degrees Fahr. until the whey is *on the point of turning sour*, when the inner tub should be immediately removed from the one containing the water, and, after pouring off the latter, take a piece of cheese-strainer cloth and tie it over the empty tub, pouring the curds and whey in the cloth, the whey running through the latter whilst the curd remains in it. Gently stir the curd to prevent packing and running together, and, after allowing it to cool for a short time, finely powdered salt may be added at the rate of 4 oz. to the 10 gallons of milk used. In half-an-hour the salted curd will be sufficiently cool to be placed in a mould, which is a circular galvanised hoop (perfectly smooth inside and open at both ends) 12 inches high, having a diameter of 7 inches, with a wooden lid or follower fitting closely into it. The mould containing the cheese should have a square block of wood (placed on top of the closely-fitting follower) of sufficient depth so as to be an inch or so above the top. This should then be placed under the press, which is made as follows:—In any well-shaded position from the sun, nail two upright battenings (3 by 1) about 2¼ inches apart, with narrow edges facing position of intended lever lengthwise. In these battenings bore ½-inch holes diagonally, beginning at 11 inches from the floor and working upwards. Then secure the battenings to a veranda post or any other firmly fixed upright. Then take 10 feet of 2 by 3 quartering, boring ½-inch hole 3 inches from one end, which place between the battenings, putting a ½-inch bolt through the two battenings and quartering, thus forming a lever that will not twist sideways. Place the mould containing the cheese under the lever about 1 foot from the uprights, then put the block on the follower and allow the lever to come squarely on the block. The diagonal holes are made simply to allow the lever to be shifted up or down, so that it may be perfectly level when pressing on the cheese. The weight of the lever alone will be sufficient for first pressure before clothing the cheese. After remaining in the press for half-an-hour the mould containing the cheese should be removed, and the solidified mass shaken out on to a planed board. It may then be clothed in the following manner: A piece of fine muslin (called cheese bandage cloth) is sown like a bag open at both ends and slipped over the cheese, fitting closely, and cut a sufficient length to allow about 1½ inches to be neatly pleated down

on either end of the cheese; then place on the end of the cheese a circular piece of calico of sufficient circumference to allow the edges to overlap the sides of the cheese by 1½ inches, after which the mould is slipped about halfway down the clothed cheese, and both cheese and mould turned over on to an oblong (three sides of which are turned up about ¼-inch) and the other end pleated in, placing a square piece of calico sufficiently large to cover this end of the cheese (these calico cloths should be removed on taking the cheese from the press, and can be used again when required). The follower or lid is then put into position, and the mould containing the cheese put under the press, having a weight equivalent to 60 lb. on the end of the lever furthest from the cheese. On the following morning an additional weight of about 40 lb. should be added, and after 2 hours' pressing the cheese is fit to be removed from the press, and should present a smooth surface, showing that the cubes of which it is composed are perfectly amalgamated. It should then be removed to a room having a temperature of not less than 60 degrees Fahr. or above 75 degrees Fahr.; an even temperature of 67 degrees Fahr. being the most perfect for curing cheese, and of sufficient dryness to prevent the cheese turning mouldy. After being turned and wiped, say twice a day, during the first week, and once a day during the succeeding weeks, at the expiration of two months the article is fit for consumption.

The following is Mr. Baron Jones's recipe for making rennet:—

Use rennets from calves not more than eight days old. Turn these rennets inside out and wipe dry with a clean cloth; after turning back blow them out like a bladder and hang up in a dry place for 2 weeks away from fire or sun; they can then be used as follows, viz.:—Take seven rennets and cut them into strips like shoe laces; have ready boiled and thoroughly cooled 5 gallons of water, in which place the cut up rennets in a *stone* jar, adding sufficient salt to leave always a little undissolved in the bottom of the jar. Stir or rub occasionally, and in 3 or 4 days the preparation will be ready for use. One pint of the above should be sufficient to curdle 40 gallons of milk in 40 minutes. But rennets sometimes varying in strength, more or less of the preparation will be necessary to obtain the desired result, which should be arrived at in not less than 40 minutes, or more than 50 minutes. It is almost needless to add that strict cleanliness is necessary at all times in preparing this mixture. The above is simply a standard recipe; a smaller number of rennets can be used in the same proportion.

A SIMPLE CHEESE PRESS

can be made from a new oil can, a 3-foot board, and a 2 by 4 scantling 5 feet long. When the heat of the curd is reduced to 78 degrees it is ready for the press. At a higher point, the fat is liable to escape, and

if too cold, the curd particles do not adhere. Bandages are easy to make of cheese cloth. Sew a strip, the circumference and height of your tin, to a round piece of the required size. Another round piece will be needed to lie on the top of the cheese folding the wall piece down on it.

FEEDING WHEY TO CALVES.

By E. GRAHAM, Dairy Expert, and FRANK SMITH, B.Sc., Etc.

At the present time a good deal of attention is being given to the utilisation of milk for cheese-making purposes, and a considerable amount of the milk supply that was formerly devoted to butter-making purposes is now converted into cheese.

In many instances it automatically follows that this change in venue has led to an alteration in the nature of the dairy by-products used as food for calves, and young calves are reared on the dairy farms upon whey, to the exclusion of skim milk.

In order to understand the significance of this change in diet, and the influence it is capable of exercising over the dairy herds of the future, it becomes necessary to consider the relative composition and value of skim milk and whey when used as food for young calves.

Generally it is to be accepted that average milk contains approximately 87 per cent. of water, 13 per cent. of solids.

The total solids of milk may be further subdivided and set down as being 4 per cent. fat, 9 per cent. non-fatty solids (of which one-third, or 33 per cent., is casein).

In cheese-making most of the butter fat and all the casein is won from the milk. By the extraction from the milk of the butter fat and casein combined, the whole milk loses 54 per cent. of its total solids, and it follows that sweet whey contains not more than 6 per cent. of solids, which are comprised principally of milk sugar. At a glance it is to be seen that whey as a food for the calf is lacking in protein, and unless this deficiency in the amount of protein is adjusted the calf is not to be amply sustained.

However, whey is to be rendered a useful food for the purpose of feeding to calves when supplemented by certain nitrogenous meals, such as linseed meal or corn meal.

Assuming that feeding whole milk to the calf and allowing it free access to succulent pastures constitutes the ideal condition under which the young animal is to be grown, then, if success in calf raising is to be achieved, we will perforce need to fortify the whey and render it somewhat similar to whole milk in nutriment, otherwise the calf will become impoverished, its growth will be checked, its vitality lowered, and the beast rendered highly susceptible to disease, and lacking the essential

robustness of constitution and vigour that no dairy farmer can afford to incur the risk of sacrificing by conveying permanent injury to the growing animal by feeding to it a ration lacking in its full complement of nourishment. It must not be overlooked that the young heifer of to-day will be the dairy cow of the future.

Kellner estimates a calf aged from two to three months requires daily ·34 lb. protein for every 100 lb. of its live weight. Estimating the weight of the young calf at, say, 50 lb., we may consider that the animal needs ·2 lb. of protein as its daily ration.

The capacity of a calf of this weight is equal to consuming about 1½ gallons of fluid per day, and this amount of sweet whey provides ·1 lb. protein and ·9 lb. of total nutriment.

The addition to the whey of approximately one-third pound of linseed meal supplies a further ·33 lb. of digestible nutrients, raises the total nutriment to 1¼ lb., and furnishes the desired complement of protein.

Following on the above basis of a maintenance ration for the young calf, and treating more specifically with the matter of rearing calves upon a diet principally composed of whey, it is recommended that:—For the first ten to fourteen days of its existence the calf should be fed solely upon the milk yielded by its mother, given at blood heat (100 deg. Fahr.)

For a further period of one week, ¾-gallon each of sweet whey and whole milk, mixed in equal proportions, should constitute the daily ration, afterwards the whole milk may be withheld, and the calf, aged from three to six weeks, maintained upon a daily ration of 1½ gallons of sweet whey, to which has been added 5 oz. of linseed meal. If whey is very sour at time of feeding it is advisable to add also 2 oz. maize meal or pollard.

As the calf ages beyond six weeks the addition of 4 oz. of maize meal or pollard is advisable.

The added meals should be boiled in sufficient water to make a thin gruel preparatory to their introduction to the whey, and this course is absolutely necessary in the case of feeding linseed meal, which is capable of exerting harmful influences if the boiling process is neglected.

Caution also must be taken that the linseed meal in boiling is not permitted to gather into lumps, as by this means some of the meal may be prevented from liberating its poisonous agent it is liable to contain: on this account also it is inadvisable to feed the linseed in quantity exceeding that stipulated.

All fluid matter fed to the calf should carry a temperature of 100 deg. Fahr.

The calf should be provided with clean, dry surroundings and adequate shelter, and when old enough should be allowed to graze on uncontaminated pastures, in the calf run.

The system of providing individual animals with separate drinking-bowls has in practice been found efficacious in minimising the spread of infectious ailments.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, FEBRUARY, 1916.

Five thousand nine hundred and sixty-two eggs were laid during the month. H. Hammill wins the monthly prize with 140 eggs. The following are the individual records :—

Competitors.	Breed.	Feb.	Total.
C. B. Bertelsmeier, S.A....	White Leghorns ...	117	1,423
J. D. Nicholson, N.S.W.	Do.	132	1,415
A. H. Padman, S.A.	Do.	133	1,404
Mrs. Munro	Do.	102	1,372
A. W. Bailey	Do.	122	1,363
J. R. Wilson	Do.	112	1,360
E. F. Dennis	Do.	110	1,353
J. M. Manson	Do.	115	1,351
J. Gosley	Do.	95	1,350
J. M. Manson	Black Orpingtons ...	113	1,348
Jas. McKay	White Leghorns ...	101	1,340
Kelvin Poultry Farm	Do.	127	1,339
W. Parker	Do.	134	1,333
King and Watson, N.S.W.	Do.	120	1,333
H. Hammill, N.S.W.	Do.	140	1,323
A. T. Coomber	Do.	123	1,321
C. Knoblauch	Do.	137	1,320
E. A. Smith	Do.	125	1,308
T. Fanning	Do.	122	1,307
O.K. Poultry Yards	Do.	104	1,301
W. Purvis, S.A.	Do.	127	1,297
Cowan Bros., N.S.W.	Do.	119	1,281
Mrs. J. Jobling, N.S.W.	Black Orpingtons ...	93	1,280
T. Fanning	Do.	110	1,277
C. T. Clark	White Leghorns ...	108	1,272
Moritz Bros., S.A.	Do.	118	1,272
E. A. Smith	Black Orpingtons ...	132	1,269
R. Burns	Do.	118	1,268
E. V. Bennett, S.A.	White Leghorns ...	103	1,266
W. Lindus, N.S.W.	Do.	129	1,259
J. H. Gill, Victoria	Do.	134	1,243
F. Clayton, N.S.W.	Do.	107	1,242
S. E. Sharpe	Do.	73	1,233
E. Le Breton	Do.	104	1,228
R. Burns	S. L. Wyandottes ...	117	1,224
Geo. Tomlinson	White Leghorns ...	122	1,222
Derrylin Poultry Farm	Do.	103	1,209
W. Meneely	Black Orpingtons ...	106	1,207
R. Jobling, N.S.W.	White Leghorns ...	103	1,201
J. G. Richter	Do.	114	1,193

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Feb.	Total.
Cowan Bros., N.S.W.	Black Orpingtons ...	105	1,192
W. Lyell	White Leghorns ...	99	1,179
Loloma Poultry Farm, N.S.W.	Rhode Island Reds ...	114	1,172
J. Zahl	White Leghorns (No. 1)	99	1,153
G. H. Turner	Do.	114	1,152
S. Chapman	Brown Leghorns... ...	133	1,137
J. Zahl	White Leghorns No. 2	106	1,126
J. Aitcheson	Do.	89	1,126
R. Jobling, N.S.W.	S. L. Wyandottes ...	79	1,110
E. Pocock	White Leghorns ...	99	1,095
F. Clayton, N.S.W.	Rhode Island Reds ...	119	1,083
W. H. Forsyth, N.S.W.	White Leghorns ...	98	1,068
J. R. Johnstone (five birds only) ..	Plymouth Rocks ...	84	841
Totals	...	5,962	66,341

WAR ON RATS AND MICE.

Notwithstanding the many methods of destroying rats, which we published in the February issue of this journal, further advice is asked by a correspondent. We heard last month that an entirely new material has been placed on the market by Messrs. Dalgety and Company, Brisbane, who are the sole agents for Queensland for a liquid named "Ratinol," which, it is claimed, is the best and surest rat-destroyer yet employed. The inventor is Dr. J. Christmas, M.D., of Paris and Copenhagen universities. In consideration of the splendid service his Ratinol has rendered to the French Ministry of Agriculture, the title of Officer of the Legion of Honour was conferred upon him by the French Government. Mr. J. C. Pound, Government Bacteriologist, Queensland, reporting to the Minister of Agriculture on Ratinol as an agent for destroying rats, instanced the results of two experiments made by him:—

"*Experiment* 1.—Four healthy rats were fed with pieces of bread on which a little Ratinol was sprinkled. Result: Two rats died on the first day, one on the second day, and one on the fourth day.

"*Experiment* 2.—Thirteen healthy rats were fed with a mixture of bran and pollard with a small quantity of Ratinol added. Result: Four died on the first day, one on the second day, two on the third day, four on the fourth day, and one on the fifth day.

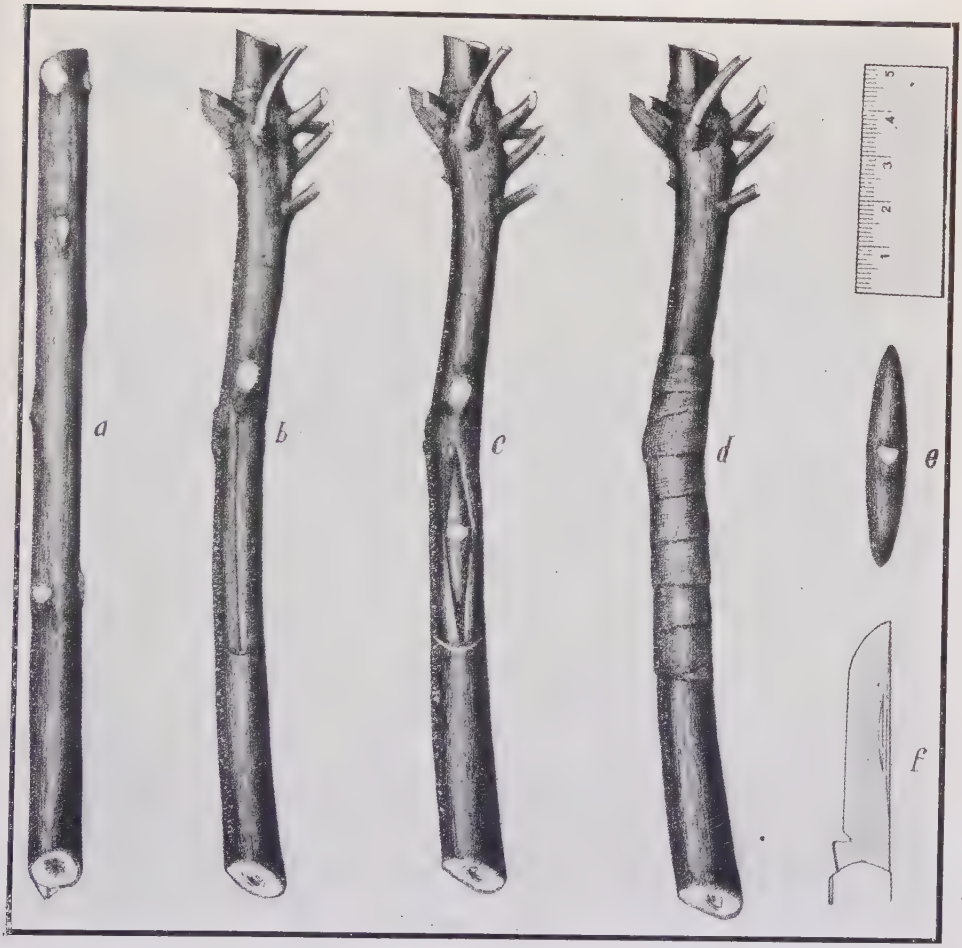
"The results of these experiments show that Ratinol can be used successfully as a means of destroying rats."

Ratinol is harmless to human beings, live-stock, dogs, cats, and birds. Analysts have found no trace of poison in it. Rats and mice eat it greedily. A small bottle of it can be bought for 2s.

The Orchard.

BUDDING THE MANGO.

We are indebted to Mr. P. J. Wester, horticulturist in charge of the Lamao Experiment Station, Lamao, Bataan, Philippine Islands, for the accompanying illustration and explanation of the process of budding the mango, as successfully adopted by him. The "formula" was published in the "Philippine Farmer":—



(*a*) Bud wood; (*b*) section of stock showing incisions made preparatory to the insertion of the bud; (*c*) bud inserted; (*d*) bud tied; (*e*) bud; (*f*) budding knife.

When mango trees are a meter (about 3 ft. 3 in.) in height they should be budded. This is not difficult, if proper precautions are observed. The first of these is to sharpen the budding knife so that it is sufficiently keen to shave the hair on one's forearm. If a budding knife

is not obtainable, grind the point of a pocket knife to the shape of the blade in the text figure.

In order that the budding operation may serve its purpose, bud wood should be taken from an old tree that is known to be productive and to bear fruit of good quality. Select from this tree bud wood that is well matured from the first, second, and third flushes from the end of the branch. This bud wood is always green and smooth.

About three weeks in advance of the date when the budding is to be performed, cut off the leaf blades of the bud wood selected. This causes the leaf stalks to drop. When scars left after the petioles have fallen are well healed, the bud wood is in condition for budding. (See illustration.)

The buds should be cut about 4 centimeters long (about $1\frac{3}{5}$ in.), with an ample wood shield, and inserted in the stock at a point where the bark is green and smooth, like the bud wood, not where it is rough and brownish. Use waxed tape and cover the entire bud. When in the course of two or three weeks a good union has formed, unwind the wrapping so as to expose the leaf bud from which the growth is to issue, and cut off the top of the stock 10 to 15 centimeters above the bud.

Every ten days after unwrapping the buds go through the nursery and carefully rub off all sprouts from the stock in order to force the buds to gow. When the graft has made a growth of about 30 centimeters, cut off the stock immediately above the point of insertion of the bud.

There are yet no budded or grafted mango trees in bearing in the Philippines, but judging from the experience in other countries, it is reasonable to believe that budding or grafting process will hasten the bearing age of the mango by at least three years, if not more, and it insures the quality in all cases.

THE QUEENSLAND INDUSTRIAL GAZETTE.

We have received from the Director of Labour, Brisbane, the first number of the above Gazette (11th March), which will be published monthly hereafter, and will contain a general report of the work being done by the Labour Exchanges, and it is the intention of the Department of Labour to collect as much accurate information as possible for monthly publication, showing the exact position of the various industries throughout the State. Such a publication, replete as it is even in the first number with varied information of interest alike to employers of labour and employees, should prove a valuable addition to literature affecting all classes of the community.

Viticulture.

THE GRAPE VINE AND ITS CULTURE.

By C. ROSS, F.R.H.S., Instructor in Fruit Culture.

Fig. 1.—Perfect Vine Cutting.

The grape vine adapts itself to a very wide range of soils and climate, there being very few parts of Australia, even under apparently uncongenial conditions, where certain varieties will not be found to grow and produce fruit.

It will grow on the poorest of sand and on stiff clayey soils if proper attention is paid to cultivation, drainage, manuring, &c., and will survive the coldest winters. Situations where late spring frosts are prevalent should, however, be avoided. In districts subject to excessive heat and drought, the land should always be deeply trenched or subsoiled before planting, and where the subsoil is wet and cold, artificial draining is absolutely necessary.

An ideal site for a vineyard in Southern Queensland would be a good, free, fertile, sandy loam, with natural drainage on a north-easterly aspect.

Where a due east or south-easterly aspect is chosen, it should be where there is an intervening ridge or belt of timber to break the first rays of the morning sun, which, to a great extent, will prevent the disastrous effects of late spring frosts. The same recommendation applies to other aspects subjected to cold, hot, or drying winds.

PLANTING.

The distance apart depends upon the quality of the soil and the moisture contained. If the situation is very dry and the soil weak, more room between the plants will be required, but a good average distance is 10 ft. between the rows and 6 ft. from plant to plant for trellised vines. Bush vines supported by stakes should not be less than 7 or 8 ft. apart each way. After the land has been thoroughly and deeply prepared and settled down, the simplest method of planting is with an ordinary bar used in the same manner as a dibbling stick.

PROPAGATION—CUTTINGS.

The universal custom of propagation is by cuttings (Fig. 1) of 15 in. to 18 in. long taken from the winter prunings. The cuttings are tied in bundles and stratified

in sand in a cool place until spring. It will be found by that time that the tissue at the base of each cutting has become calloused. They are then planted to their permanent positions by inserting them in the ground to two-thirds or three-quarters of their length, leaving one or two buds exposed. Choose short-jointed cuttings in preference to those with long internodes.

GRAFTING.

FIG. 2.—Proper Scion for Cleft Graft.

Bench-grafting is now very largely employed for the prevention of the ravages of *Phylloxera vastatrix*. Cuttings of well-ripened wood of the previous summer growth are taken from American resistant stocks, or their hybrids, upon which is grafted the variety desired. The usual method adopted is either the "cleft" or the "whip tongue" graft. After being grafted, the cuttings should be stratified in sand. When calloused, they are planted out with the union well below the surface. The scions should not be furnished with more than two buds (Fig. 2), and one is sufficient for young stocks. For the first three months after vegetative activity has commenced, the soil covering the point of union should be occasionally removed and all roots emanating therefrom carefully pruned off and the soil replaced.

Many other methods of grafting and budding are employed for working over established vines of indifferent varieties, but for all practical purposes the old English "cleft" and the "whip tongue" grafts are the only two that need be discussed. In my own experience I have found the cleft to be the most successful when grafting old vines level or under ground. The operation is very simple. For instance, select a vine of any age up to twenty years. Saw off the stem above the level of the ground in midwinter (June or July), and paint the transverse section with a mixture of horse dung and clay or lime and sulphur. In August, or just before the sap is moving, the stock should be again cut back to the level of the surface. Choose a

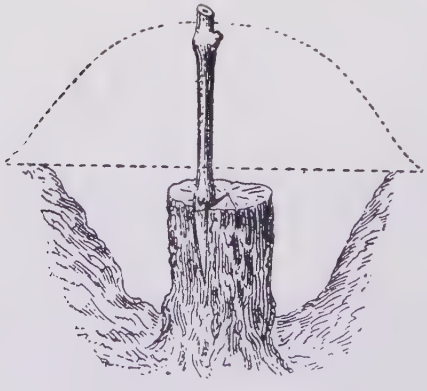


FIG. 3.—Single Cleft Graft.

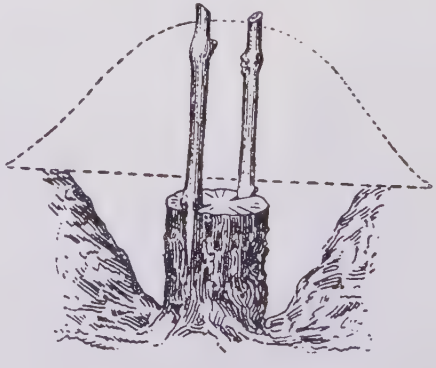


FIG. 4.—Double Cleft Graft.

backward or dormant scion, and shave it down to a wedge shape (see Fig. 2) from the base of a node down the internode; cleave the stock with a strong knife or chisel, and insert the scion down one side of the cleft. If the stock is large enough, two scions may be inserted, one on each side, bringing the inner bark or cambium layers of both stock and scion in exact juxtaposition. (See Figs. 3, 4, 5, and 6.)

Fig. 5.—Cleft-grafted Cutting—Scion with Single Bud.

Fig. 6.—Grafted Cuttings when Ligatured.

It is always safer to bind the stock to prevent spreading. The soil is then hilled up, completely covering the scion and protecting the point of union from air and water. All surface and adventitious roots must be suppressed, and after the union has become perfect the soil may be drawn away and made level with the natural surface.

Allow the graft to make its full growth the first summer with very little pruning or pinching. Suckers, however, arising from the stock must be rigorously suppressed.

The whip tongue graft is best practised on young vines or cuttings, and is performed as follows:—The stock and scion should be of the same diameter. A clean, sloping cut is made slightly above the node of the stock, and a corresponding one below the node of the scion. The closer these cuts are made to the nodes the better, for it is near these points where most of the knitting tissue is formed, and a more perfect union is the result. (See Fig. 7.) A short parallel slit is made about a-quarter of an inch deep, corresponding in each face of the splice.

The slit is slightly opened by a turn of the knife to facilitate the insertion of the tongue. (See Fig. 8.) The larger area of cut surface thus brought into exact juxtaposition produces a greater amount of callous or knitting tissue. After being brought together, the splice is kept firmly bound with a ligature of rafia or soft twine. (See Fig. 9.)

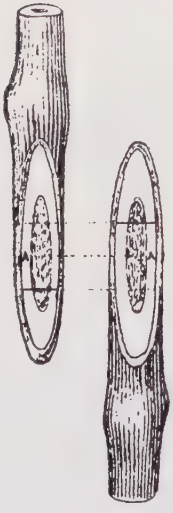


FIG. 7.—How Stock and Scion is cut for W.T. Graft. Centre dotted line shows where the slit forming to tongue is made.

FIG. 8.—Prepared Stock and Scion with tongue opened.

FIG. 9.—W.T. Graft brought together and ready for the ligature.

SHORT PRUNING.

When vines are planted out on the diagonal or square system, the gooseberry bush or goblet form of pruning is generally (Fig. 10) adopted, each vine being supported by a single stake.

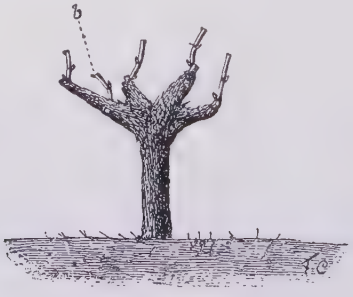


FIG. 10.—Goblet Pruned Vine.

After the first season the cutting will have made a growth similar to that shown in Fig. 1, Plate I. At the first pruning, all the canes

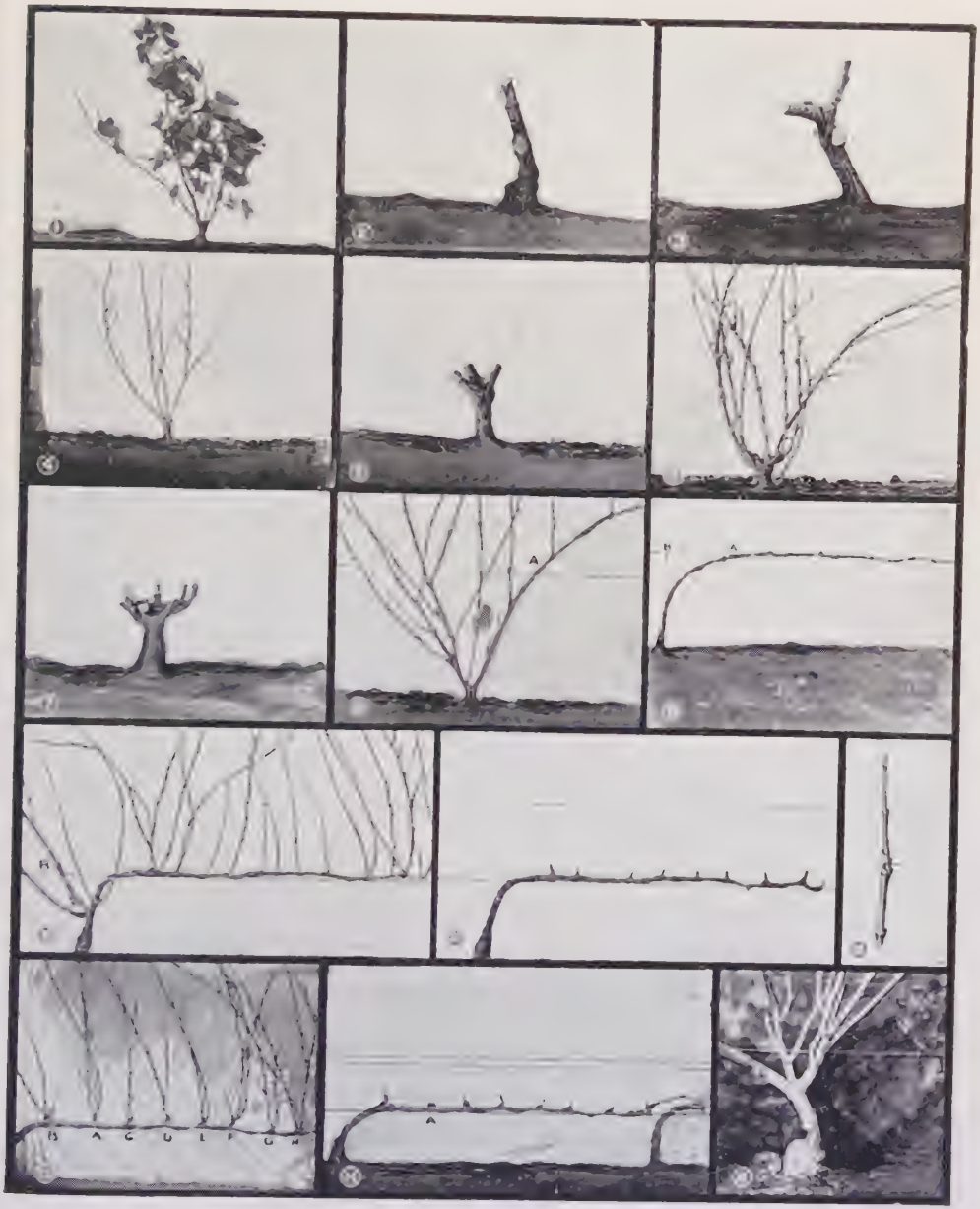


Plate I

are cut away, leaving one spur with two eyes, as in Fig. 2. Two or even three spurs may be left if exceptionally strong growth has been made. Fig. 4 represents the second year's growth, and should be pruned to three or four spurs of two eyes each, as in Fig. 5. These will eventually form the main arms of the goblet, as in Fig. 7.

TRELLISED VINES.

Unilateral Cordon or permanent rod with spurs is also called the Royat.

The writer favours this system for the variety or varieties of uniform growth and grown as trellised vines.

The first season's growth from the cutting is pruned as in Fig 2, which should eventually produce a growth similar to Fig. 8. By judicious pinching and stopping of laterals and other shoots not required one long, strong cane will be produced by the end of summer. (Fig. 8 A.) At the subsequent winter pruning all the side shoots are cut clean off, leaving only the one rod. The vines being planted 7 ft. apart, this cane should be pruned back to a little short of that length and tied down to the bottom wire of the trellis with a graceful curve. (See Fig. 9.) The bottom wire should be about 18 in. from the ground. The following winter this cane becomes a permanent rod with canes (see Fig. 10); each of these canes is then pruned to two eyes, as in Fig. 11. All spring and summer shoots arising from the neck of the vines and underside of the rod must be rigorously suppressed. The curves in Figs. 10 and 11 are too sharp and have caused the strong growth at B, which should have been rubbed off on its first appearance.

The first spur on the rod should not be less than 12 inches from a vertical line of the base (Fig. 9). At the succeeding pruning it will be found that most of the spurs will have put forth two canes (Fig. 13 and Fig. 13B); the top cane should be cut out close to the lower one,

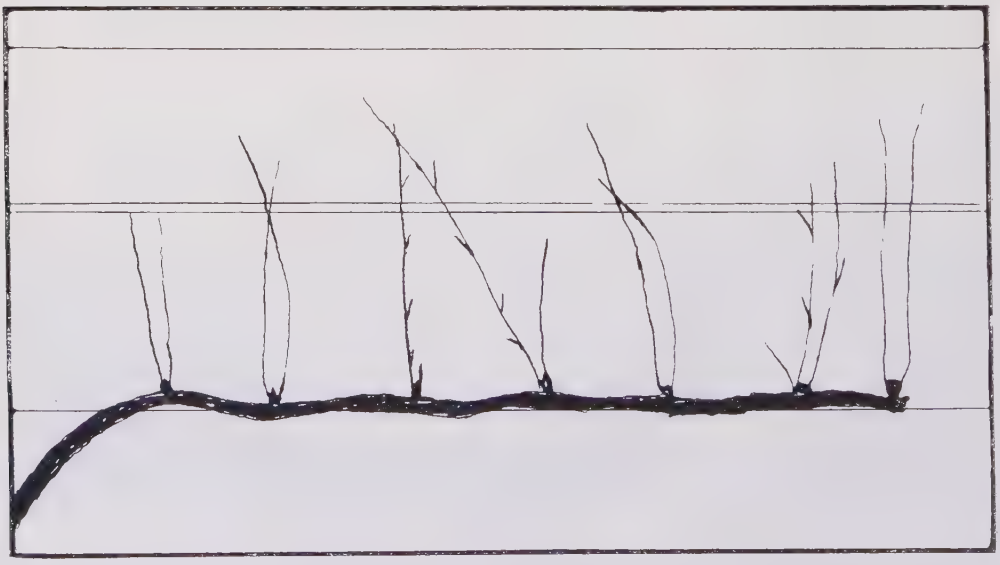


FIG. 13B.—Unilateral Cordon Vine before Pruning.

and the remaining cane pruned to two eyes (Fig. 14). Should only one cane have issued from a node, it must be pruned to two eyes. The last spur on the rod is treated differently. Of the two canes issuing there-

from, the upper one is pruned to several eyes and tied down to meet the first spur of the next vine (Fig. 14). This is called the annual terminal fruit branch, with return spur beneath (which is better illustrated in Fig. 14B) and acts as a safety valve to the superfluous sap flow, also as

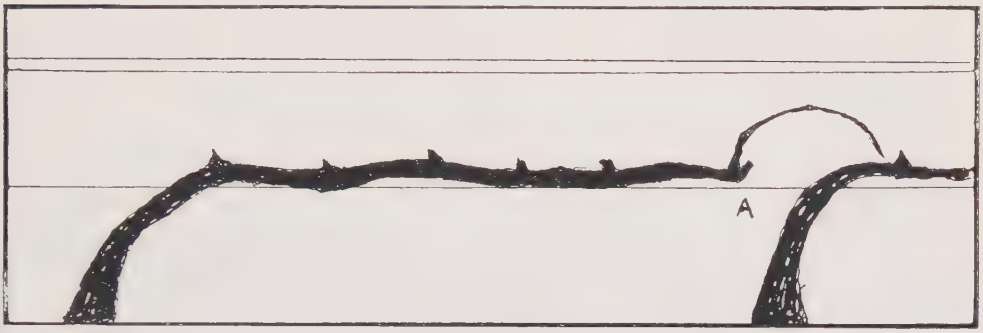


Fig. 14B.—Similar Vine after Pruning.
The annual terminal fruit branch is here more distinctly shown.

a protection to the neck of the adjoining vine. The lower cane is pruned to two eyes, forming the return spur, and will furnish two canes for the following season, to be treated in the same manner. The terminal fruit branch is only an annual expedient, which is pruned off at each winter pruning and is again reproduced from the upper cane of the return spur left for the purpose. (*The above figures refer to Plate I.*)

Thomery Spalier or Bi-lateral Cordon.

This is a two-armed vine, and is formed as follows:—

An upright shoot arising from a young vine in spring is pinched back before approaching the bottom wire. Several laterals will eventually

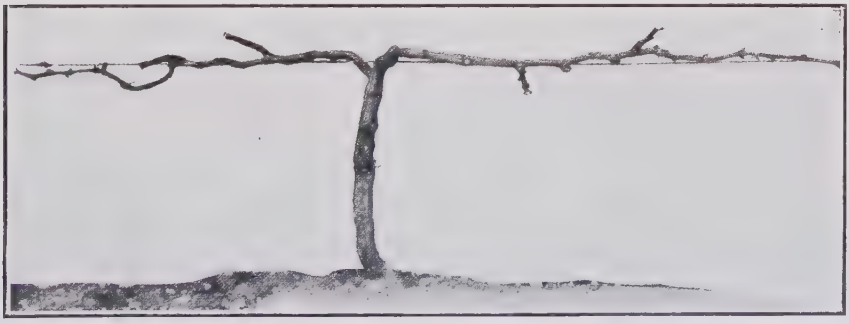


Fig. 11.—Thomery Spalier.

push forth; the top one is allowed to grow, whilst others beneath may be pinched back at their first leaf. The lower laterals are not required except for the purpose of elaborating sap to strengthen the main stem. The following winter the growth will be similar to Fig. 12, Plate I., when the lateral cane is pruned as indicated by the dotted line, *i.e.*, near its base and above the group of eyes showing at that point.

Several shoots may issue from this point during the following spring, and two of these should be selected and trained along the wire, one on each side, as main arms or permanent rods. Other shoots are rubbed out. At the next pruning the rods are shortened to meet those of the neighbouring vine. The canes issuing from the nodes of these two rods are pruned to two eyes as in the Royat system.

Two examples of Thomery spur pruned vines are shown in Figs. 11 and 12.

FIG. 12.—Thomery Espalier (aged).

LONG PRUNING.

THE BORDELAISE SPALIER.

This is an excellent system for almost any class of vines.

Select a young vine which has been pruned to two spurs, as in Fig. 3, Plate I. The following spring several canes will issue from these two spurs. At the subsequent pruning the upper cane, or the one situated furthest from the base of each spur, is then bent down to the wire and shortened to six, eight, or more eyes, and the return spurs nearer the base are pruned to two eyes. The return spurs may produce fruit, but their chief function is to provide canes and spurs to replace the annual fruit canes already tied down, and which are completely cut out after producing their one crop. As will be observed, the object of this method is to provide new fruit rods and spurs for every year's crop. (See Figs. 13 and 14.)

FIG. 13.—Bordelaise Spalier.

Fig. 14.—Bordelaise Espalier.

The Casanave Cordon.

The vine is pruned as a uni-lateral cordon. After the permanent rod has been laid down, short pruning is followed until it arrives at the stage shown in Fig. 13, Plate I. The upper cane at each spur is now shortened and tied down, and the return spur pruned to two eyes (Figs. 15 and 16.) Where only one cane occurs, it should be pruned to two eyes.

Fig. 15.—Casanave Cordon Fruiting Canes and Return Spurs.

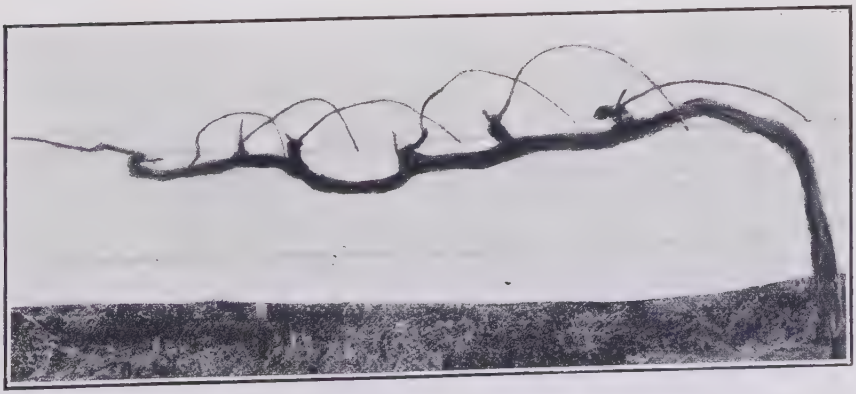


Fig. 16.—Casanave Cordon, Fruiting Canes and Return Spurs.

HIGH AND OVERHEAD TRELLIS.

It is often desired that cottage and villa gardeners require an overhead shaded walk or drive, pergola, or summer-house covered with diciduous plants, for which there is no better subject than the grape vine. It must be borne in mind that the most vigorous varieties should be selected, and if the sides and roof of such structures are to be properly adorned, separate vines are necessary for each purpose. Say, for instance, a covered avenue of any length is desired, cuttings or rooted plants may be put in at intervals of 6 ft. along each side of a walk of not less than 10 ft. wide. Each alternate vine is then trained to an upright stem, and on reaching the height of the structure is stopped, and two of the shoots issuing therefrom are trained right and left, and at the following pruning are stopped on approaching the arms of the next vine. At the subsequent pruning three or four canes may be allowed to proceed from each arm and tied down to cover the roof. Any growths issuing from the main stem itself must be suppressed, and it is unwise, no matter how fertile the soil may be or how strong the vine may grow, to allow it to cover the upper structure in less than three seasons. The same method of stopping and winter pruning must be adopted in the initiatory stages as that of other systems. The intermediate vines for furnishing the walls only are treated in the same manner as the Royat or Guyot.

The fan-shaped vine or any one system is not satisfactory for furnishing both roof and walls. (See Fig. 17.) Separate vines are used for each purpose. The lines indicate where the canes should be pruned.

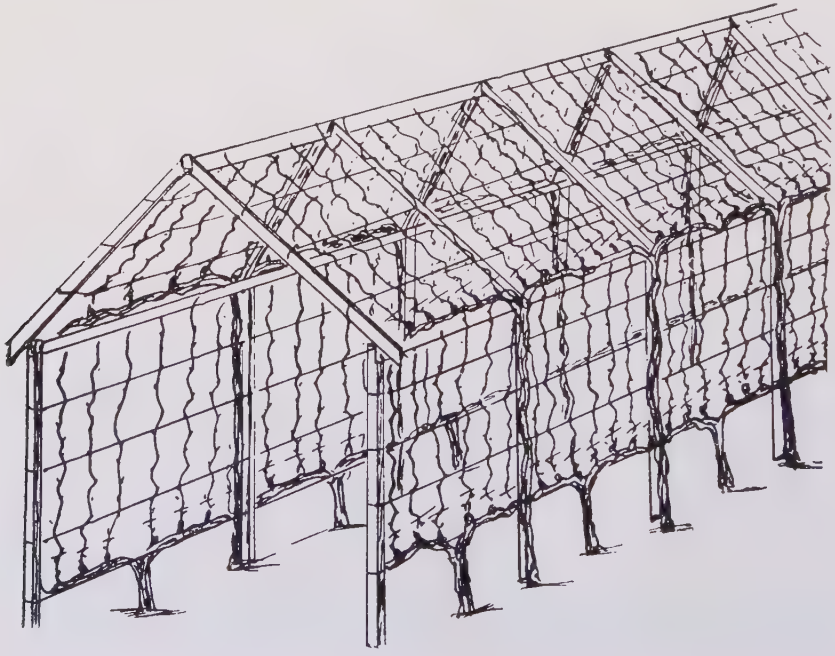


FIG. 17.—Showing Separate Vines for Covering Walls and Roof. Short lines indicate where the canes are to be pruned.

There is another system of pruning which, in some cases, it is absolutely necessary to follow. Some varieties of grapes, such as Ohanez (Almeria), Schradzouli, Calabrian Raisins, and several others would never satisfactorily bear at Westbrook with either short or long pruning by the foregoing systems. Lateral canes should be encouraged by stopping the summer growth. It has been proved on such varieties as the above that strong, well-ripened, lateral canes are the only medium

Fig. 18.—Long Pruned, with Return Spurs—mainly Laterals.
a, b, main cane; b, c, lateral.

for producing a good crop. Fig. 18 shows how the canes were stopped and laterals produced the previous summer, and the subsequent winter pruning.

SUMMER PRUNING.

In the case of vines that have been properly spurred back at the winter pruning—*i.e.*, each spur pruned to one, two, or more eyes according to the vigour of the canes and the variety of grapes—each bud should have put forth one or more shoots. Where more than one shoot occurs, the weakest should be rubbed off, leaving one shoot only at each node. If the vine is not a vigorous grower, one shoot may be sufficient to leave on each spur; on the other hand, where growth is rampant, two or more shoots may be allowed to proceed from the spurs. Overcrowding is to be avoided by entirely suppressing some of the intermediary shoots where the long spur or cazanave is adopted.

It often happens that amateurs and inexperienced growers leave many more bunches on the vine that it can properly support, especially in the case of young vines of three years old, and the consequence is that the bearing period, and even the life of the vine, is shortened, or its production diminished in after years; therefore, the disbudding of fertile shoots may be equally important with that of the barren ones. The uppermost shoot, or shoots, of a spur generally absorb an undue amount of sap to the detriment of the base shoot. Such growth must be carefully watched, and, if extraordinary vigour is produced, it may be checked either by bending down the shoot or pinching out the terminal points. The side branches from these shoots, called laterals, produced from below the node where the bunch is situated, should be rubbed out; but laterals from the nodes at and above the bunch may be pinched at the first or second leaf. The lower shoot of a spur—*i.e.*, the one nearest home—should be encouraged to grow strong, as this will consti-

tute the fruiting spur for the following year. Indiscriminate topping must be avoided. The leading shoots of the vine should be allowed to extend their growth almost to an unlimited extent, but in cases where they are outbalancing the vegetative activity of the vine, they should be stopped. It is even better to bend down the shoots than to top them too severely. The object of this method is to preserve as much well-grown foliage as possible for the accumulation of sugar and elaboration of sap for the benefit of the fruit and lignification of wood. The bunches are always better developed, more handsome in appearance, and of higher quality when ripened in the shade; but when the shade becomes too dense it is better to strip off a few of the older leaves at the base that have fulfilled their purpose than to cut away the branches.

CINCTURING OR RINGBARKING AND GIRDLING.

This method is largely practised in the Southern States and other vine-growing countries. A more uniform setting of the fruit, larger berry, and earlier maturity is assured. The cincture is performed by

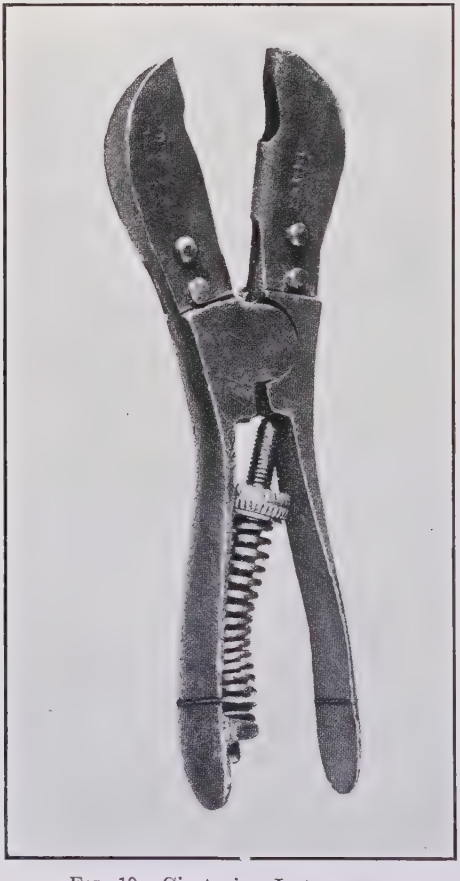


FIG. 19.—Cincturing Instrument.

removing a very narrow ring of outer bark without injuring the woody tissue or cambrum layer. The effect is to check the return flow of sap, which is then elaborated in the bunches and foliage instead of proceeding to the root. The best time to do this is when the vine is in full flower; if done later it is useless for increasing the setting, but will ensure a crop of seven to ten days earlier than untreated vines, which is important for catching the early market. Either young or old rods may be treated. Where old rods have been denuded of spurs, new shoots may be encouraged to start if the cincture is made below the old node. A knife may be used for removing the ring, but it can be done much quicker with the small instrument in Fig. 19.

Fig. 20.—Cinctured Vine.

Girdling is simply a piece of No. 8 or 10 wire twitched round the large limbs of fruit trees. The navel orange, mango, and other fruits have given good results from this treatment, although the girdle is never so satisfactory as the cincture.

FIG. 21.—How Performed.

FIG. 22.—Grapes after Vines being Cinctured.

Fig. 23.—Uncinctured Vine.

DISEASES AND PESTS.

Phylloxera vastatrix or Vine Louse.—It is hardly worth while to combat this disease when firmly established. It is preferable to root out infested vines and plant none but those grafted to immune stocks.

Anthracnose, Black Spot, Oidium, and Fungus generally are best prevented by the sulphuric acid solution, which is swabbed on every portion of the vine in spring, just before the buds are bursting, but must not be applied after growth has started or every bud would be destroyed. As soon as the young foliage appears, the whole vineyard should be freely dusted with flowers of sulphur or sprayed with weak Bordeaux mixture, and repeated at three or four week intervals up to the time the berries begin to colour.

Formula for sulphuric acid is ¾ pint to 1 gallon of water. Care must be taken when mixing this solution, and the acid must be added slowly to the water to avoid splashing. Old clothes should be worn when applying.

There is an excellent preparation now being sold in Brisbane called "Atomic Sulphur." It is largely used in California and in our Southern States. Being in liquid form, it is applied as a spray against all fungoid diseases.

Caterpillars of the vine moth and other leaf-eating insects may be destroyed by arsenate of lead spray. If white ants attack the vines, a few pounds of Kanite dug about the stems will get rid of them.

MANURING.

Vines planted in well-prepared virgin land will not require manuring for the first two or three years, but after that period, or when they arrive at the full bearing stage, the fertility of the soil should be kept up.

I cannot do better than give the remarks of our Agricultural Chemist, J. C. Brünnich, on this subject:—

"Improved methods of cultivation and the use of artificial fertilisers increase yield and quality of the fruit considerably. Excellent results have been obtained in South Australia with a yearly application of—

1 cwt. superphosphate
¼ cwt. sulphate of potash
¼ cwt. sulphate of ammonia
} per acre.

or applying about 3 oz. of the mixture to each vine.

"In many localities a heavier dressing of artificial fertilisers may be profitable, using for instance—

2 cwt. superphosphate
1 cwt. sulphate of potash
½ cwt. sulphate of ammonia or nitrolim
} per acre.

or about ½ lb. of the mixture to each vine.

"Green manuring, in addition to the yearly application of artificial fertilisers, is strongly recommended, and the crop should be ploughed under to a depth of at least 9 in."

Liming the soil every five or six years with about 1 ton of air-slaked lime or gypsum per acre may also be very profitable.

A FLY DESTROYER.

H. Maxwell-Lefroy (curator of the insect house at the London Zoo) at Fly Farm, Middlesex, would appear to have solved the problem of a cheap and effective trap. This experimenter has tried every imaginable bait, from strange chemicals to beer and bananas, and he has at last found the ideal bait that fills his bottle traps full of flies. It is casein, brown sugar, and water mixed in equal parts. This mixture must be left to stand for twenty-four hours or so before a fly will take much notice of it. Then some slight change sets in, due no doubt to fermentation, and from that moment it will not be kept away. Some subtle smell about the mixture appeals to house-fly taste, and they surge anxiously round the bottle, looking for the way in. Casein, as you know, is the chief solid in milk, the curd from which cheese is made. It can be obtained by scouring the milk, or by the use of rennet, as employed by cheesemakers. It may be worth mentioning that the slime left in the bowl of the separator consists largely of casein, and as this is entirely a waste product it might well be tried first in combination with the sugar and water as a bait for the flies.

Tropical Industries.

RICE.

Some years ago (about 1901), rice was grown in both South and North Queensland and was found to be a very profitable crop. In the South the district lying between the Logan, Albert, and Pimpama Rivers, known as Pimpama Island, proved itself eminently adapted to the successful cultivation of this crop. The soil consists of sandy loam, containing in a remarkable degree the constituents most suited to the nature and requirements of the plant, being easy to work, but somewhat tenacious in wet weather. Layers of decomposed marine shells are found in considerable quantities, indicating that these lands were once ocean-washed, and the receding waters left valuable deposits of lime and other constituents in the soil, which, together with the rich humus formed by the decaying foliage of scrub vines, palms, ferns, &c., of rank tropical growth, have left these patches of soil of varying area between the swamps most suitable for rice culture.

There is no great labour required in the preparation of the land for this crop. With Upland rice, the question of drainage does not enter largely into consideration; at the same time, stagnant water is detrimental.

To bring the soil to as fine a tilth as possible, the ordinary methods may be adopted—that is, to first plough, letting the soil afterwards lie for a week or so to ærate and sweeten. Then cross-plough and harrow. The best time for sowing is in September or early in October, when the first rains may be expected in normal seasons. There are three systems of sowing. Broadcast (chiefly for fodder purposes), planting in drills, and transplanting from nursery beds. For broadcasting, 60 lb. of paddy (unhusked seed) to the acre will be needed, the seed being harrowed and treated in the same manner as oats or wheat in the after cultivation. The plan most generally adopted, and by far the best and cheapest, is to plant the rice in drills 2 ft. 6 in. or 3 ft. apart, and about 10 to 12 in. between the plants, by means of a seed drill. This will require 35 to 40 lb. of seed per acre. By the drill plan, the crop will be more even, and not so patchy as when sown broadcast, and it enables the grower to go through the crop with the hoe on the cultivator. The third plan, we may dismiss an impracticable, as it is a most tedious and costly method, only adopted in countries where coloured labour is plentiful and very cheap, and where swamp rice is the variety universally grown in such countries. Briefly, the seed is sown in nursery beds 20 ft. long by 6 ft. wide, which will give sufficient plants for a quarter of an acre. When the plants are 6 in. high they are planted out in the soft, swampy soil about 1 ft. apart in rows 2 ft. 6 in. apart. The labour involved is a very serious

consideration, and the cost may be imagined by considering what the cost of planting out wheat, barley, or oats in this fashion would be. Furthermore, swamp rice requires a system of irrigation by which the fields may be inundated at certain stages of growth, and this is not feasible in many districts where Uplands rice would be grown to a profit, given a normal rainfall.

From the "Tropical Agriculturist," Ceylon (15th October, 1915), we learn that in British Guiana the cultivation of rice rose from 6,000 acres in 1898 to 45,000 acres in 1914, an increase which represents about 32,000 tons of cleared rice per annum, worth about £450,000. The rice there grown is known as "Creole," the choicest strain of which is "Berbie." It was found that locally-grown paddy gives from 60 to 65 per cent. of its weight of clear rice. In 1914, 240 tons of rice meal were exported. The average yield of paddy per acre in Guiana is 22·2 cwt. and equivalent to 41 bushels.

Harvesting the Crop.

This was a difficult matter to undertake with the rice formerly planted in the Logan district, the China and some of the Japan varieties being so brittle that when ripe the least touch caused the grains to drop off with a consequent loss of seed. This has been happily overcome to a certain extent by the better variety planted. Not only does the White Java give better facility for harvesting, but the straw is of a better colour and quality, of a good length, averaging from 4 ft. to 5 ft., and in good land even 6 ft. is no unusual length; and no more fair or gratifying sight to the farmer's eyes can be imagined than the rich appearance of a rice field ready for harvesting: this is whilst the stalks have still a bronze-green appearance, the heads have turned a golden brown, about half-way down, and appear what a wheat farmer or an inexperienced person would deem three-parts ripe. The heads of rice, heavy with grain, have a graceful, drooping appearance; as many as thirty to forty heads have been produced from a single grain planted—the product weighing from 10 oz. to 14 oz. By cutting some varieties of rice in this state, the loss is not so great as with over-ripe grain. The cutting is begun in the morning as soon as the dew is off, the rice being bound up into very small bundles, ready to be threshed as soon as possible (which will be explained later on). Rice is never left stooked in the field, but is treated as quickly as possible.

The usual method pursued in harvesting is to cut with the ordinary sickle or reaping-hook, although where large areas are now being planted it is thought that the latest inventions of wheat-harvesting machinery could be used most effectively. A slight alteration in the reaper and binder might be required in the way of lighter and broader wheels on

the rich soft rice lands, but otherwise I see no difficulty in the harvesting. At all events, it is the intention of the writer to induce some firm to make a trial at next harvesting as an experiment, and if successful a machine will doubtless be obtained on co-operative lines for the use of the district. After cutting with the sickle, the rice is gathered into bundles and carted into the barn or shed, or, if not sufficiently dry, is left for a day or so to ripen; but this it not often the case, experience having taught our farmers the right time to cut, and it is generally taken to the barn at once for stripping or threshing.

RICE-GROWING IN VICTORIA.

The "Australasian," writing on the rice industry in Victoria, said:—

"From time to time reports have appeared of experimental work in rice-growing, carried out by Mr. I. Takasuka, of Tyntynder West, on the Murray River. Mr. Takasuka has been working on the principle that rice growing in a temperate climate is always of a better quality than that grown in the tropics, and has experimented with fifty-six varieties to discover one suitable to the soil and climate of his district. He has found, according to a report furnished through Messrs. Law, Somner and Co., a variety called Kahei to be the best, and has improved this variety by selection for four years until the selected seed, which is named after himself, is deemed suitable to our Victorian soil and climate.

"At Tyntynder the seed is sown from September to November by drill or broadcast at the rate of 40 lb. to 60 lb. per acre, according to the soil. The seed germinates at a temperature of 56 degrees, and the plant does not suffer from frosts. At the end of December the plant stools out, sometimes to thirty shoots from one seed. From three to eight waterings are necessary, according to soil and season; but in any district where there is a good rainfall between November and February a good crop can be reckoned upon. Rice ripens from April to May, and can be stripped or winnowed, or cut with a binder and threshed, after drying in the stook. Mr. Takasuka recommends the latter method for large areas, and considers that there are thousands of acres in Victoria not suitable for wheat-growing which can be profitably turned into rice country.

"Most people think rice cannot be grown in cold places, but if it is acclimatised it will grow just the same as in warmer parts. Imported rice mostly comes from Burmah, where they cannot grow as good quality as here. An average yield over a fair area is half a ton per acre, but the selected variety has given over 1 ton per acre, which is worth from £14 to £18 per ton.

"We import £200,000 worth of rice every year, and it pays a duty of 3s. 4d. per cwt., so that where irrigation can be practised it may pay to grow instead of wheat. Rice straw is used for making ropes, matting, and bags, and is considered in the East a valuable feed for stock, which, harvested in May, comes in when other feed is scarce. After the grain is stripped, the straw that is left can be cut close to the ground, and this is excellent for chaff. The stubble will then make a splendid grazing for all stock. On 40 acres seventy horses were kept for five weeks, and then followed by 500 sheep for two weeks last season."

We now learn that in accordance with an arrangement made eight years ago, when permissive occupancy of 200 acres of land at Tyntynder, near Swan Hill, Victoria, was given to enable experiments to be made in rice-growing, the Lands Department has now granted a perpetual lease of the area named to Mr. I. Takasuka, a Japanese, who has conducted the tests.

Mr. Takasuka showed Mr. H. S. W. Lawson, Minister for Lands, recently, some fine samples of rice both in ear and winnowed. He said that he had been handicapped last season, as there was insufficient water. From 10 acres he had secured an average of half a ton to the acre, or 5 tons in all. In good spots he had obtained as much as 1 ton to the acre. Samples had been sent by him to agricultural schools in Victoria and New South Wales. He had been assisted by his three children—two boys and a girl.

About seven years ago Mr. Takasuka brought out from Japan an expert to assist him for ten months in making the initial experiments. He considers that the land in the Swan Hill district is suitable for rice-growing.

Messrs. Law, Somner and Co., seed merchants, Swanston street, Melbourne, have been appointed sole agents for the sale of Takasuka rice seed. The price for small quantities is 2s. per lb. For lots of 1 cwt. 1s. 9d. per lb., and for 2 cwt. lots or over 1s. 6d. per lb., carriage extra.

It seems strange that whilst we have thousands of acres of land admirably suited for rice-growing, we have allowed the industry to drop, and import rice to the value of £96,000 a year, all of which could be as easily grown as wheat or maize, and to a greater profit, employing, as in other rural industries, only white labour.

In 1899, the total area under rice in Queensland was 319 acres, which produced 9,275 bushels of "Paddy," equal to 320,617 lb. of clean rice. In that year, over 9,000,000 lb. of rice were imported into Australia. In 1915, the area under rice in Queensland had dwindled to 3 acres, producing 66 bushels of grain (paddy), which was the least average yield since 1911. The highest average yield was in 1908, 38·57 bushels per acre. In the Pimpama district, the yield frequently amounted to 40 bushels of paddy per acre.

Entomology.

COMBATING THE CANE BEETLE.

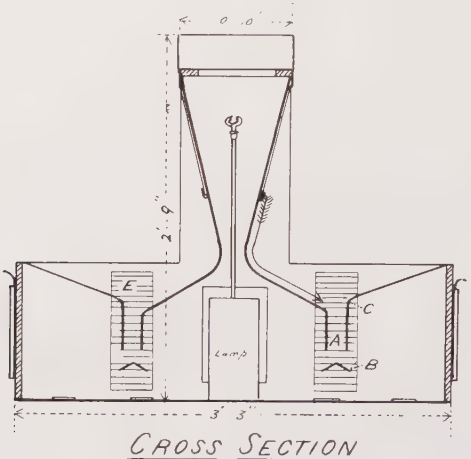
The General Superintendent of Sugar Experiment Stations has received the following report from Mr. Edmund Jarvis, Entomologist to the Bureau, for the month of January:—

Field investigations in connection with the oviposition of our cane-beetles (*Lepidiota albohirta*) proved disappointing, a single batch of eggs having been discovered as a result of an examination of about 150 cubic ft. of ground. These eggs, to the number of thirteen, were found deposited loosely in the soil at a depth of 5 in., and almost directly under the centre of a stool of ratoon cane. It was hoped to have secured sufficient evidence to warrant the publication of recommendations regarding control of this stage by the practise of certain cultural methods during the period immediately preceding oviposition. Such advice, however, will need to be postponed until next season, when it is expected to obtain conclusive data on this important matter. Breeding experiments undertaken at the laboratory for the purpose of determining the quantity of eggs layed at a time, and whether a beetle deposits more than one batch, yielded evidence of a somewhat indefinite nature, the numbers laid by different specimens varying from ten to twenty-six.

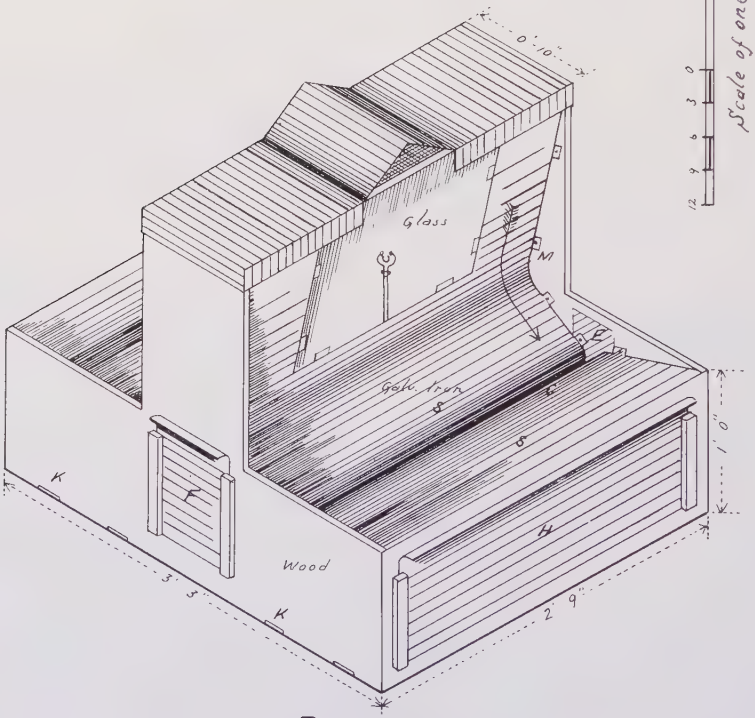
As a result of numerous dissections, I am inclined to believe, from the structure of the ovary, that the majority of eggs usually mature simultaneously and are deposited in one large batch of about twenty-four, after which, under normal conditions, a few additional eggs may be laid loosely in the soil either singly or in small batches containing three or more. The two ovaries together comprise twelve ovarian tubes, the stalk of each holding three eggs, two of which, in each tube, develop first as already mentioned, while the other twelve furthest from the oviducts continue quite small. After deposition of the main batch of twenty-four these others may develop, although apparently the full number rarely do so. Examination of the ovary of a beetle that died in confinement after laying twenty-six eggs revealed the presence of an additional nine in different stages of growth. Under natural conditions some or perhaps all of these might have found their way into the soil before the death of the female. About 350 young larvæ were hatched from eggs laid by mealy-back beetles confined at the laboratory during December and January, and will be used in future experiments relating to the control of the grub stage of this pest.

A NEW LIGHT-TRAP FOR CANE BEETLES.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following description and illustrations of an original form of light-trap from Mr. Edmund Jarvis, acting Entomo-



CROSS SECTION



ELEVATION

logist to the Bureau. Mr. Jarvis states that the trap is suitable for capturing our "mealy-back" cane beetle (*Lepidiota albohirta*), and designed with the purpose of taking advantage, firstly, of its mode of

approach and behaviour whilst reacting to white light; and, secondly, of its inability under certain restrictive conditions to fly from off the ground in a vertical direction.

Mode of Reaction.

In a previous report ("Australian Sugar Journal," vol. VII., pp. 448, 449), it was mentioned that this insect, instead of attempting to dash directly into the flame, approached it in an erratic manner by a series of short flights, settling at brief intervals on the ground or on cane-plants, and ultimately plunging headlong downwards at a distance of about 1 foot from the light.

Referring to the accompanying illustrations, it will be seen that the galvanised-iron landing stage (S), inclined at an angle of about 30 degrees, affords no foothold to beetles falling upon it, which are at once shot through the aperture (A) on to a narrow strip of metal (B in section), from which they slip into the body of the trap. Those striking the ground near by invariably endeavour to reach the light by making short upward flights, until finally pitching upon the stage and unable to cling to it they slide downwards to captivity by mere force of gravity, owing to a habit possessed by this species of keeping its wings closed for several seconds after settling.

Both sexes react strongly towards acetylene light throughout their aerial existence, and in the event of first attempts to reach the flame during windy nights proving unsuccessful generally work to leeward of the trap and fly in against the breeze.

Reaction ceases a few minutes after capture, the specimens remaining stationary for the rest of the night and apparently unaffected by the entrance or motions of additional victims. Cane beetles passing overhead usually circle around the light for a second or two before attempting to settle on the stage, but occasionally make a sudden dash for the flame and encountering the glass are shot by the impetus in the direction of the arrow until they strike the horizontal ridge marked (C) and drop into the trap. Escape is impossible, as the species in question cannot take flight from the narrow strip (B) owing to want of room in which to expand its wings, and, moreover, is unable at any time to fly up vertically, a fact that may be simply demonstrated by putting a healthy mealy-back cockchafer into an empty ½-lb. cocoa tin and leaving it on a table with the lid off, when it will be found that, although the insect may live several days, its numerous attempts to escape from the open mouth prove unavailing and it will finally die there. Similarly, the strips of kerosene tin on sides of the trap at (E) by affording no foothold effectually prevent egress in that direction.

Results.

Unfortunately, owing to pressure of work and the occurrence of moonlight nights during the period of greatest emergence at Meringa, the trial of this light-trap was postponed until after oviposition had taken place and the majority of beetles forsaken the canefields.

Immense numbers had also perished on the 20th December prior to oviposition as the result of a heat wave.

On 24th December it was decided to light the trap for the first time, as the moon did not rise until 9·15 p.m., and would thus allow an hour and a-quarter of darkness. It was accordingly placed among young plant cane and provided with an acetylene lamp of 21 litres capacity. This was lighted at 7·45 p.m., as a few cockchafers were heard buzzing about, but no positive reaction took place until 8 o'clock, when it had become quite dark. The sky at this time was somewhat overcast, the thermometer registering 81 degrees F. and a light south-easterly breeze blowing.

Beetles now commenced to fly into the trap from all directions, many being attracted while in the act of passing rapidly overhead about 15 feet above the ground.

By the time the moon had risen, at 9·15 p.m., 57 specimens of *albohirta* had been captured, and during the next twenty minutes 9 more entered in spite of the moonlight, making a total of 66. The experiment was then discontinued, as beetles had stopped flying, but I have no hestitation in saying that had they been present in force a greater number would have been caught. Such, too, would have been the case if the light had been placed near food-plants; but the above experiment was purposely conducted about a mile and a-half from a favourite feeding ground, so that the only specimens captured were those actually invading the plantation. No doubt it will be argued that the popular method of gathering cane-beetles by shaking them from bushes, &c., is both simpler and more likely to be remunerative than any attempts at trapping by means of artificial light. To this I would reply, that present methods of collecting should, of course, be continued, since they deal with vast numbers frequenting feeding-trees, many of which—during a period of about two weeks immediately following a general emergence—are females carrying eggs in various stages of development; but at the same time we are apt to forget that the ordinary collector altogether misses great numbers of pregnant females that having succeeded in eluding capture in the trees finally visit the canefield at night for the purpose of entering the ground to oviposit. It is these beetles, in fact, that are directly responsible for future trouble; and, further, I am disposed to believe that practically all the annual damage done to a crop is effected in each district during one or more favourable periods of about four consecutive nights each. This assumption is not unreasonable when we reflect that a general emergence of cockchafers occupies about three days and is at once followed by copulation, and that a fortnight later or thereabouts most of the females of this brood are in a condition to oviposit. As soon as this critical stage is reached the plantation is sure to be invaded without further delay, and during the succeeding four or five nights, when such wholesale mischief is being worked, it assuredly behoves us to capture as many beetles as possible. In the event of natural conditions happening to be congenial, a number of light-traps placed at intervals among a crop of young plant or ratoon cane would probably catch the majority of egg-laden females entering the fields during this important

period, and on grossly infested areas could hardly fail to prove highly advantageous. Hand collecting certainly tends to thin the ranks of the enemy, but it is, I repeat, invading beetles, and those only, that do the mischief, therefore their capture must of necessity take place among the cane, and before they have had time to enter the soil. As already pointed out in previous reports, the only profitable time for using light-traps is during the interval between the acts of emergence and egg laying, the length of which is determined by climatic influences, and, in the event of an occurrence of two well marked emergences, may extend for a month or six weeks.

The number of favourable nights in this period, however, will depend on the position of the moon, temperature, and other factors. A dark warm night following a hot day offers ideal conditions, especially when rain has fallen during the forenoon, or the sky happens to be cloudy, and there is little or no wind. Should emergence take place at such a time excellent results would follow the use of light-traps during the next few nights; but in the event of these ideal conditions obtaining at the critical times of egg-laying alluded to above we should make the utmost use of so important an opportunity.

Construction of Trap.

The design of this trap is altogether different from that of the various forms advocated by other writers in the past, which appear to have been constructed without consideration of the aerial movements of our cane-beetle during its reaction to artificial light, and consequently failed to come up to expectations. The present trap not only takes advantage of such reactionary motions, but whilst capturing this pest permits the escape of parasitic and predaceous insects, many of which also fly to light, and from their presence in canefields doubtless serve a useful purpose by helping to maintain the balance of nature. Some of these species, as previously reported ("Australian Sugar Journal," vol. VII., pp. 448, 449), have already been recorded as natural enemies of certain insect pests of sugar-cane, and merit careful protection.

To meet this requirement it has been thought advisable to forego the use of solutions and allow captured beetles to remain alive. They become inactive and torpid after daybreak and can then be transferred without difficulty to bags in the usual way, and sold to help defray expenses.

The construction of the trap used in this experiment is shown by the accompanying illustrations, and consists of a light framework of wood with flat bottom of deal or galvanised-iron, enclosing an inclined platform, sliding doors, roofing, &c., of the same metal bent to the various curves shown by the cross-section. Two small panes of stout glass are inserted in opposite sides of the vertical upper portion of the larger sheets, and a piece of close mesh wire-gauze in the centre of the roof just over the flame. The lamp is introduced through a small door at (F) the two larger sliding doors in opposite sides—one of which is shown at (H)—being used when removing the beetles. The iron trays

covering ends of roof are moveable, and the end of one is bent up to form an angular hood over lamp to exclude rain. Parasites and predaceous beetles escape through the slit-like openings indicated at (K), which being only a quarter of an inch high prevent the exit of small cane-beetles—*Anomala australasiae,* for example—a few species of which are attracted by artificial light.

During the experiment in question the trap was stood upon four butter boxes (one at each corner), the acetylene flame being not more than 3 feet above ground level, but higher than the cane. The glazed sides were faced south-east and north-west—the principal line of flight taken by this insect—while the area of direct illumination extended northerly from west-south-west to north-north-east, and southerly from east-north-east to south-south-west. A handy man could make this trap in a few hours. The author found it a simple matter to construct the one used at Gordonvale. The materials needed are an old deal packing case, about 34 square feet of galvanised-iron, 2 panes of glass 18 in. by 12 in., and half a square foot of wire-gauze; costing in all, owing to present high prices, about 15s. A simply way of fixing the iron by means of small oblong pieces left for the purpose when cutting the sheets is shown at (M).

Recommendation.

On the whole, the above-mentioned results appear satisfactory enough to warrant further experimentation with this form of light-trap or such modification of it as may be found desirable on the score of greater simplicity or cheapness; and I would suggest the advisibility of constructing a number for trial next season. These should be placed in the centre of a badly infested plantation at regular distances apart with the object of protecting a definite area of young plant cane.

MANGO VINEGAR.

We are indebted to Mr. Charles Meilland, Byfield, Yeppoon, for the following recipe for making mango vinegar, for which we were asked by a correspondent in November last. At that time we were unable to give instructions as to how to make it.

Mr. Meilland has been making mango vinegar for several years with great success, and his recipe is:—

"When mangoes ripen, peel them, and place them in a small barrel. Cover with water and leave them in it for a week. Then strain the juice and add 1½ lb. of sugar to every gallon. After this, bottle, and in four months the vinegar is ready for use. The older it is, the better. It makes a splendid table vinegar. The pure mango juice without water added, makes a stronger vinegar.

"Mango wine can be made much in the same way, but more sugar is required."

General Notes.

UTILISATION OF CORN COBS.

Much has been written in the United States, both in agricultural newspapers and in official bulletins issued by various agricultural universities of several States, on the value of corn cobs as an adjunct to fodder for stock. As far as Queensland is concerned, corn cobs have no value in the opinion of maizegrowers. They are often used as fuel, but otherwise they are allowed to rot in heaps on the farm.

Now it has over and over again been demonstrated by long-continued experiments in the United States that corn cobs have a considerable food value when ground up along with the corn into a meal. The "Journal of the Jamaica Agricultural Society" (November, 1915) in an article on the subject states that, as the result of an experiment made in the United States, where 10 pigs and 20 steers formed the subjects of the experiment, the object being to test the question of the food value of corn cobs, it was found that 1 lb. of corn and cob meal was worth more, as a food, than 1 lb. of meal made from the corn alone. Now, as there is a large proportion of the ear, *i.e.*, cob, the cob is worth about 18 per cent., it seems that there is an undoubted waste in not utilising the cobs—waste in two directions, because, first the corn has to be shelled and then ground into meal, whereas the shelling is saved by grinding the corn and the cob together; and secondly, the additional food value in the cob.

It should be borne in mind, however, that the corn and cobs must be ground fine, but the mills are set to do this. It has also to be remembered that to grind whole ears, about three times as much power is wanted than is needed in grinding the same amount of shelled corn. The following analysis should be of interest:—

—	Albumenoids.	Digest. Nutrients. Carbo Hydrates.	Fat.	Comparative Value.
	Per cent.	Per cent.	Per cent.	
Corn-cobs { from	0·6	41·7	0·2	37
Corn-cobs { to	1·1	43·2	0·4	49
Corn-stalks	1·1	37·0	0·3	36
Corn	8·4	60·6	4·8	100

* The above analysis was made by J. C. Brünnich, Agricultural Chemist to the Queensland Department of Agriculture, and appeared in the "Queensland Agricultural Journal" for January, 1916.—Ed. "Q.A.J."

Professor E. W. Stewart, in his "Feeding Animals," recommends strongly to pass the whole corn crop—stalks, ears, and all—through a large cutter and reduce it to a fine chaff.

That corn cobs, which here are always waste product, have a very considerable value as stock food has been demonstrated in the long-continued general experience of American farmers.

A ton of ordinary wood when burned only gives 100 lb. of potash, 32 lb. of phosphoric acid, and 640 lb. of lime.

Sawdust when burned into ash gives 70 lb. of potash, 160 lb. of phosphoric acid, and 680 lb. of lime.

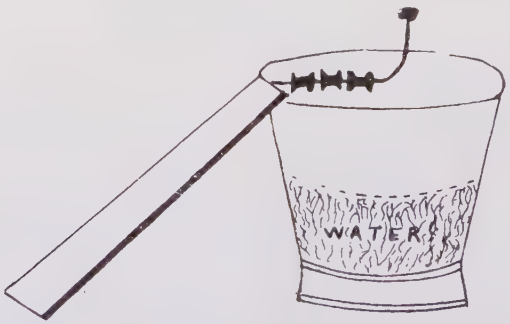
But a ton of corn cobs burned into ash gives 500 lb. or potash, 90 lb. of phosphoric acid, and 140 lb. of lime.

ORIGIN OF THE NAVEL ORANGE.

The navel orange first appeared at Bahia, Brazil, as a bud sport of the Portuguese variety of orange, *Laranja selecta,* and was first propagated by a Portuguese gardener at Bahia in 1822. These statements and those that follow are made on the authority of A. D. Shamel, physiologist of the United States Department of Agriculture, Riverside, California, who tells in the "Journal of Heredity," the results of an expedition to Brazil made by himself, P. H. Dorsett, and Wilson Popenoe. There are about 50,000 trees growing navel oranges at Bahia. The navel orange was introduced into the United States in 1873 by William Saunders, horticulturist and landscape gardener of the Patent Office. He got the American Consul to send him some of the trees, which he budded on seedlings grown in the Government greenhouses. He sent two to California and the others to Florida. The latter never amounted to much, but the former thrived and are still living and bearing fruit. All the navel orange trees in California are their progeny. There are about 100,000 acres of this variety in that State, and about 10,000,000 boxes are produced every year. The navel orange cannot be grown from seed, as it contains no seed. It is in California generally budded upon stocks from the Mission sweet seedling orange.—Exchange.

A NOVEL MOUSE OR RAT TRAP.

Mr. J. F. Keane, Carbeen, sends us the following sketch and description of an ingenious trap for rats and mice he remembers using during the great plague of mice on York's Peninsula, South Australia:—A small board, one end resting on the rim of an ordinary milk pail nearly



half full of water. A piece of No. 8 wire stuck into the end of the board, three cotton reels strung on the wire, and its end turned up with the bait. We always got the best bags with a piece of cooked bacon or a piece of toasted cheese. The mice were in such countless swarms everywhere that on one occasion I took the trouble to count the dead out of one pail—150 was the tally for that morning.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR MARCH, 1916.

Article.		MARCH. Prices.
Bacon	lb.	1s. 3d. to 1s. 5d.
Bran	ton	£5 5s.
Broom Millet	,,	£32 to £35
Butter	cwt.	125s. 4d., 130s. 4d., 135s. 4d.
Chaff, Mixed	ton	£3 5s. to £6 5s.
Chaff, Oaten	,,	£6 to £7
Chaff, Lucerne	,,	£8 to £9
Chaff, Wheaten	,,	£5 5s.
Cheese	lb.	10d. to 10¼d.
Flour	ton	£11 8s.
Hams	lb.	1s. 5d.
Hay, Oaten (Victorian)	ton	£8
Hay, Lucerne	,,	£7
Honey	lb.	4½d. to 5d.
Maize	bush.	6s.
Oats	bush.	3s. 6d.
Onions	ton	£8
Peanuts	lb.	3d. to 4d.
Pollard	ton	£5 5s.
Potatoes	,,	£14
Potatoes (Sweet)	cwt.	12s.
Pumpkins	ton	£7 to £8
Eggs	doz.	1s. 6d. to 2s. 7½d.
Fowls	pair	4s. 6d. to 6s. 6d.
Ducks, English	,,	4s. 6d. to 5s.
Ducks, Muscovy	,,	6s. to 7s. 6d.
Geese	,,	8s. to 9s.
Turkeys (Hens)	,,	11s. to 12s.
Turkeys (Gobblers)	,,	17s. to 25s.
Wheat	bush.	6s.

VEGETABLES—TURBOT STREET MARKETS.

Cabbages, per dozen	3s. to 8s.
Beans, per sugar bag	1s. to 2s.
Beetroot, per dozen bunches	8d. to 1s.
Carrots, per dozen bunches	9d. to 1s. 3d.
Chocos, per quarter-case	...
Cucumbers, per dozen	6d. to 9d.
Custard Marrows, per dozen	6d. to 1s.
Vegetable Marrows, per dozen	6d. to 1s.
Lettuce, per dozen	9d. to 1s.
Peas, per sugar bag	3s. 6d. to 8s.
Parsnips, per dozen bunches	1s. to 1s. 3d.
Celery, per dozen bunches	...
Sweet Potatoes, per cwt.	12s.
Table Pumpkins, per dozen	2s. 3d. to 6s.
Tomatoes, per quarter-case	1s. 3d to 3s.
Turnips, per dozen bunches	8d. to 1s.
Rhubarb, per dozen bundles	...

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY. Prices.
Bananas (Queensland), per case	8s. to 10s.
Bananas (Fiji), per case	15s. to 16s.
Bananas (G.M.), per bunch	16s. to 17s.
Mandarins, per case	...
Mangoes, per case	6s. to 10s.
Oranges (Navel), per case	...
Oranges (other), per case	...
Passion Fruit, per half-bushel case	5s. to 9s.
Lemons (Local), per bushel case	12s. to 18s.
Papaw Apples, per double-case	...
Persimmons, per half-case	3s. 6d.
Pineapples (Queens), per double-case	5s. to 8s.
Pineapples (Ripleys), per double-case	5s. to 6s.
Pineapples (Common) per double-case	5s. to 6s.
Tomatoes, per quarter-case	3s. to 5s.
Cucumbers, per case	...

PRICES OF FRUIT—TURBOT STREET MARKETS.

Article.	MARCH. Prices.
Apples, American, per case	6s. to 7s.
Apples, Cooking, per quarter-case	4s. to 5s.
Apricots, per quarter-case	...
Bananas (Cavendish), per dozen	2d. to 4d.
Bananas (Sugar), per dozen	2d. to 4¼d.
Cherries, per case	...
Cocoanuts, per sack	12s. to 15s.
Custard Apples, per quarter-case	...
Granadillas	...
Lemons (Lisbon), per case	13s.
Lemons (Italian), per case	21s. to 22s.
Limes, per quarter-case	...
Mandarins (Local), per half-case	9s. to 11s.
Mangoes, per case	6s. to 8s.
Nectarines, per quarter-case	...
Oranges (Navel), Japanese, per case	16s. to 17s.
Oranges (other), Italian, per case	17s. 6d. to 20s.
Papaw Apples, per quarter-case	1s. 6d. to 4s.
Passion Fruit, per quarter-case	4s. to 6s. 9d.
Peaches, per case	2s. 6d. to 5s.
Pears, per half-bushel case	9s. to 11s.
Peanuts, per pound	3d. to 4d.
Persimmons, per quarter-case	3s. to 5s.
Plums, per case	4s. to 7s.
Pineapples (Ripleys), per dozen	5s. 6d. to 8s. 6d.
Pineapples (Rough), per dozen	2s. 6d to 5s. 6d.
Pineapples (Smooth), per dozen	3s. 6d. to 5s.
Rockmelons, per dozen	3s. to 6s.
Rosellas, per sugar bag	...
Strawberries, per dozen pint boxes	...
Tomatoes, per quarter-case	1s. to 2s. 6d.
Watermelons, per dozen	3s. to 6s.

TOP PRICES, ENOGGERA YARDS, FEBRUARY, 1916.

Animal.	FEBRUARY. Prices.
Bullocks	£20 15s. to £30 7s. 6d.
Bullocks (Single)	...
Cows	£12 5s. to £14 15s.
Merino Wethers	45s.
Crossbred Wethers	38s. 3d.
Merino Ewes	26s.
Crossbred Ewes	34s. 3d.
Lambs	32s. 9d.
Pigs (Porkers)	76s.
Pigs (Slips)	20s.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING FEBRUARY, 1916 AND 1915, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1916.	Feb., 1915.
North Coast.	In.		In.	In.
Atherton	9·83	15	7·06	2·94
Cairns	15·41	34	7·64	5·56
Cardwell	17·13	44	6·33	4·92
Cooktown	13·87	40	4·97	11·00
Herberton	7·37	29	10·48	2·01
Ingham	15·51	24	10·86	8·05
Innisfail	22·44	35	11·85	13·04
Mossman	16·47	5	5·33	4·41
Townsville	12·08	45	7·54	2 81
Central Coast.				
Ayr	9·47	29	7·49	0·39
Bowen	8·76	45	6·85	2·39
Charters Towers ...	4·19	34	8·78	0·95
Mackay	11·78	45	4·92	8·99
Proserpine	10·94	13	8·00	9·13
St. Lawrence ...	8 34	45	2·19	6·68
South Coast.				
Biggenden	3·72	14	4·06	6·10
Bundaberg	6·43	33	5·07	12·81
Brisbane	6·71	65	15·21	8·17
Childers	6·03	21	8·54	10·04
Crohamhurst ...	15·80	22	1·78	19·35
Esk	6·00	29	6·15	7·44
Gayndah	4·29	45	3 62	2·26
Gympie	6·91	46	3·19	8 26
Glasshouse M'tains	8·80	6	2·55	11·84
Kilkivan	5·36	37	2·65	3 85
Maryborough ...	6·74	45	7·44	7 66

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1916.	Feb., 1915.
South Coast—continued:	In.		In.	In.
Nanango	4·69	34	2·21	4·12
Rockhampton ...	8·15	29	0·73	9·03
Woodford	9·80	29	1·91	15·59
Yandina	12·66	21	4·46	13·97
Darling Downs.				
Dalby	2·94	46	4·45	1·41
Emu Vale	2·28	17	5·78	0·56
Jimbour	3·72	24	2·24	0·37
Miles	2·69	31	3·30	0·70
Stanthorpe ...	3·40	43	4·98	0·43
Toowoomba ...	4·55	44	3·39	4·01
Warwick	3·03	29	4·24	0·14
Maranoa.				
Roma	3·18	42	1·22	0·14
State Farms, &c.				
Gatton College ...	3·35	14	2·26	3·98
Gindie	2·34	13	0·48	0·42
Kamerunga Nurs'y	14·15	27	7·04	5·55
Kairi	5·24	3	4·83	1·33
Sugar Experiment Station, Mackay	9·95	16	6·42	7·51
Bungeworgorai ...	2·55	3	1·40	0·33
Warren	2·80	3	2·08	4·84
Hermitage ...	3·08	7	4·55	0·15

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals or February this year and for the same period of 1915, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Officer.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET AT BRISBANE AND THE PHASES OF THE MOON FOR THE FIRST FOUR MONTHS OF 1916.

Date.	January.		February.		March.		April.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·21	6·42	5·42	6·19	5·58	5·46
2	4·57	6·45	5·21	6·42	5·42	6·18	5·59	5·45
3	4·58	6·45	5·22	6·41	5 43	6·17	5·59	5·44
4	4·58	6·45	5·22	6·41	5·43	6·16	6·0	5·43
5	4·59	6·45	5·23	6·40	5·44	6·15	6·0	5·42
6	5·0	6·46	5·23	6·39	5·45	6·14	6·1	5·40
7	5 0	6·46	5·24	6·39	5·45	6·13	6·1	5·39
8	5·1	6·46	5·25	6·38	5·46	6·12	6·2	5·38
9	5·1	6·46	5·26	6·37	5·46	6·11	6·2	5·37
10	5·2	6·46	5·27	6·37	5·47	6·10	6·3	5·36
11	5·3	6·46	5·27	6·36	5·47	6·9	6·3	5·35
12	5·4	6·46	5·28	6·35	5·48	6·8	6·4	5·34
13	5·5	6·46	5·29	6·35	5·48	6·7	6·4	5·33
14	5·6	6 46	5·30	6·34	5·49	6·6	6·5	5·32
15	5·7	6·46	5·30	6 33	5·49	6·5	6·5	5·31
16	5·8	6·46	5·31	6·32	5·50	6·4	6·6	5·30
17	5·8	6·47	5·32	6·31	5·50	6·2	6·6	5·29
18	5·9	6·47	5·32	6·31	5·51	6·1	6·7	5·28
19	5·9	6·47	5·33	6·30	5·51	6·0	6·7	5·27
20	5·10	6·47	5·34	6·29	5·52	5·59	6·8	5·26
21	5·11	6·46	5·34	6·28	5·52	5·58	6·8	5·25
22	5·12	6·46	5·35	6·27	5·53	5·57	6·8	5·24
23	5·13	6·45	5·36	6·26	5·53	5·56	6·9	5·24
24	5·13	6·45	5·37	6·25	5·54	5·55	6·9	5·23
25	5·14	6·45	5·38	6·24	5·54	5·53	6·10	5·22
26	5·15	6·45	5·38	6·23	5·55	5·52	6·10	5·21
27	5·16	6·44	5·39	6·22	5·55	5·51	6·11	5·20
28	5·17	6·44	5·40	6·21	5·56	5·50	6·11	5·19
29	5·18	6·44	5·41	6·20	5·57	5·49	6·12	5·18
30	5·19	6·43	...	...	5·57	5·48	6·12	5·18
31	5·20	6·43	...	...	5·58	5·47	...	...

The Phases of the Moon commence at the times stated on or near the 150th Meridian, East Longitude.

		H.	M.	
5 Jan.	● New Moon	2	45	p.m.
12 „	☾ First Quarter	1	38	„
20 „	○ Full Moon	6	29	„
28 „	☽ Last Quarter	10	35	a.m.

The moon will be partially eclipsed between 6 p.m. and 7·24 p.m. on January 20th. It will be at its nearest to the earth on the 4th at midnight, and at its greatest distance on the 17th at 3 p.m.

4 Feb.	● New Moon	2	6	a.m.
11 „	☾ First Quarter	8	20	a.m.
19 „	○ Full Moon	12	29	p.m.
26 „	☽ Last Quarter	7	24	p.m.

The moon will be at its nearest to the earth on the 2nd at 10 a.m., and at its farthest on the 14th at 7 a.m. It will pass very close to the Pleiades on the 11th about midnight.

4 Mar.	● New Moon	1	58	p.m.
12 „	☾ First Quarter	4	33	a.m.
20 „	○ Full Moon	3	27	„
27 „	☽ Last Quarter	2	22	„

The moon will be farthest from the earth on the 13th at 3 a.m., and nearest on the 26th at 11 p.m. It will pass over and occult the bright star, Antares, on the 25th between 4 a.m. and 5 a.m.

3 Apr.	● New Moon	2	21	a.m.
11 „	☾ First Quarter	12	36	a.m.
18 „	○ Full Moon	3	7	p.m.
25 „	☽ Last Quarter	8	38	a.m.

The moon will be farthest from the earth on the 9th at about midnight, and at its nearest on the 21st at 9·36 p.m. It will be near the planet Neptune on the 11th at 7·30 p.m., but a good glass will be necessary to see the planet which will be rather more than the width of the moon to the south.

A total Eclipse of the Sun will occur on Feb. 3rd, visible in parts of Central and South America, in parts of the Pacific and Atlantic Oceans, and partially only in Great Britain, France, Spain, &c.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise and set about 4 minutes later than at Brisbane if its elevation (1,900 feet) did not counteract the difference in longitude. In this case the times of sunrise and sunset are nearly the same as those for Brisbane.

At St. George, Cunnamulla, Thargomindah, and Oontoo the times of sunrise and sunset will be about 17 m., 28 m., 36 m., and 47 minutes, respectively, later than at Brisbane at this time of the year.

At Roma 15 minutes may be added to the Brisbane times for January and February, and about 17 minutes for March and April.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

Orchard Notes for May.

THE SOUTHERN COAST DISTRICTS.

The advice already given respecting the handling and marketing of citrus fruits in the last two numbers of this Journal applies with equal force to this and the following months. Do not think that you can give the fruit too much care and attention; it is not possible, as the better they are handled, graded, and packed the better they will carry, and the better the price they will realise.

Continue to pay careful attention to specking, and fight the blue mould fungus everywhere. Don't let mouldy fruit lie about on the ground, hang on the trees, or be left in the packing-shed, but destroy it by burning. Keep a careful lookout for fruit-fly, and sweat the fruit carefully before packing. If this is done, there is little fear of the fruit going bad in transit, or being condemned on its arrival at Southern markets. Where the orchard has not been already cleaned up, do so now, and get it in good order for winter. Surface working is all that is required, just sufficient to keep moisture in the soil; keep down undergrowth, and prevent the packing of the surface soil by trampling it down when gathering the fruit.

Keeping the orchard clean in this manner enables any fallen fruit to be easily seen and gathered, and it need hardly be stated what has been mentioned many times before, that diseased fruit should on no account be allowed to lie about and rot on the ground, as this is one of the most frequent causes of the spreading of many fruit pests.

May is a good month to plant citrus trees, as if the ground is in good order they get established before the winter, and are ready to make a vigorous growth in spring.

Don't plant the trees, however, till the land is ready, as nothing is gained thereby, but very frequently the trees are seriously injured, as they only make a poor start, become stunted in their growth, and are soon overtaken by trees planted later that are set out under more favourable conditions. The land must be thoroughly sweet, and in a good state of tilth—that is to say, deeply worked, and worked down fine. If this has been done it will probably be moist enough for planting, but should there have been a dry spell, then when the hole has been dug and the tree set therein, and the roots just covered with fine top soil, four to eight gallons of water should be given to each tree, allowed to soak in, and then covered with dry soil to fill up the hole. In sound, free sandy loams, that are naturally scrub, holes may be dug and the trees planted before the whole of the ground is brought into a state of perfect tilth. It is, however, better to do the work prior to planting, as it can then be done in the most thorough manner; but if this is not found possible, then the sooner it is done after planting the better.

If the land has been thoroughly prepared, there is no necessity to dig big holes, and in no case should the holes be dug deeper than the surrounding ground either is or is to be worked. The hole need only be big enough to allow the roots to well spread out, and deep enough to set the tree at the same depth at which it stood when in the nursery. Plant worked trees 24 to 25 ft. apart each way, and seedlings at least 30 ft. apart each way.

Towards the end of the month cover pineapples when there is any danger of frost; dry blady grass or bush hay is the best covering. Keep the pines clean and well worked; first, to retain moisture; and, secondly, to prevent injury from frost; as a patch of weedy pines will get badly frosted when a clean patch alongside will escape without any serious injury.

Slowly acting manures—such as meatworks manure when coarse, boiling-down refuse, farm manure or composts—may be applied during the month, as they will become slowly available for the trees' use when the spring growth takes place, but quickly-acting manures should not be applied now.

THE TROPICAL COAST DISTRICTS.

May is a somewhat slack month for fruit—pines, papaws, and granadilas are not in full fruit, the autumn crop of citrus fruit is over, and the spring crop only half-grown. Watch the young citrus fruit for Maori, and when it makes its appearance spray with the sulphide of soda wash. Keep the orchard clean, as from now till the early summer there will not be much rain, and if the orchard is allowed to run wild—viz., unworked and dirty—it is very apt to dry out, and both the trees and fruit will suffer in consequence.

Bananas should be kept well worked for this reason, and though the fly should be slackening off, every care must still be taken to prevent any infested fruit being sent to the Southern markets.

Citrus fruits can be planted during the month, the remarks *re* this under the heading of the Southern Coast districts being equally applicable here.

THE SOUTHERN AND CENTRAL TABLELANDS.

Get land ready for the planting of new deciduous orchards, as, although there is no necessity to plant so early, it is always well to have the land in order, so as to be ready to plant at any time that the weather is suitable. The pruning of deciduous trees can commence towards the end of the month in the Stanthorpe district, and be continued during June and July. It is too early for pruning elsewhere, and too early for grapes, as a general rule. Keep the orchard clean, particularly in the drier parts. In the Stanthorpe district, Mr. Benson, Director of Fruit Culture, recommends the growing of a crop of blue or grey field peas, or a crop of vetches between the trees in the older orchards, as a green manure. The crop to be grown as a green manure should have the soil well prepared before planting, and should be manured with not less than

4 cwt. of phosphatic manure, such as Thomas phosphate, or fine bone-bust, per acre. The crop to be ploughed in when in the flowering stage. The granitic soils are naturally deficient in organic matter and nitrogen, as well as phosphoric acid, and this ploughing in of a green crop that has been manured with a phosphatic manure will have a marked effect on the soil.

Lemons will be ready for gathering in the Roma, Barcaldine, and other districts. They should be cut from the trees, sweated, and cured down, when they will keep for months, and be equal in quality to the imported Italian or Californian fruit. If allowed to remain on the trees, the fruit becomes over-large and coarse, and is only of value for peel. Only the finest fruit should be cured; the larger fruit, where the skin is thicker, is even better for peel, especially if the skin is bright and free from blemish; scaly fruit, scabby, warty, or otherwise unsightly fruit is not suitable for peel, and trees producing such require cleaning or working over with a better variety—possibly both.

The remarks *re* other citrus fruit and the work of the orchard generally, made when dealing with the coast districts, apply equally well here, especially as regards handling the crop and keeping down pests.

Farm and Garden Notes for May.

FIELD.—During this month the principal work in the field will be the sowing of wheat, barley, oats, rye, and vetches. There is no time to lose now at this work. Potatoes should be hilled up. Cut tobacco. The last of the cotton crop should now be picked, the bushes being stripped daily after the dew has evaporated. Cotton-growers are notified that cotton-ginning and baling machinery has been installed on the premises of the Department of Agriculture and Stock in William street, where seed cotton will be received by the Department from the growers, to whom an advance of 1¾d. per lb. will be paid. The cotton will then be ginned, baled, and marketed in the best market, and whatever balance to credit is shown when account sales are received will be distributed amongst the suppliers according to the amount of cotton supplied by them. Only bare expenses of preparing the shipments and freight will be deducted. Thus, it will be seen that cotton-growers will have a sure market for their produce. Every effort should be made to ensure feed for stock during the winter by utilising all kinds of green fodder in the form of silage or hay. Those who own dairy stock will be wise to lay down permanent grasses suitable to their particular district and soil. A few acres of artificial grass—notably Rhodes grass and Sudan grass—will support a surprisingly large number of cattle or sheep in proportion to acreage. Couch grass, in the West, will carry ten to twelve sheep to the acre. Coffee-picking should now be in full swing, and the berries

should be pulped as they are picked. Strawberries may be transplanted. The best varieties are Pink's Prolific, Aurie, Marguerite, Annetta, Phenomenal, Hautbois, and Trollope's Victoria. Aurie and Marguerite are the earliest. In some localities strawberry planting is finished in March, and the plants bear their first fruits in August. In others, fruit may be gathered in July, and the picking does not end until January.

Kitchen Gardening.—Onions which have been planted in seed beds may now be transplanted. The ground should long since have been thoroughly cleaned and pulverised, and should be rolled previous to transplanting. Onions may still be sown in the open on clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, endive, &c. Sowings may also be made of all these, as well as of peas, broad beans, kohl-rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus.

Flower Garden.—Planting and transplanting may be carried out simultaneously during this month in showery weather; the plants will thus be fully established before the early frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, pentstemons, heliotrope, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady situation out of doors. Plant bulbs such as anemones, ranunculus, snowflakes, freesias, ixias, watsonias, iris, narcissus, daffodils, &c. Tulips will not suit the Queensland climate, but hyacinths may be tried, although success is doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.